ELECTRICAL REVIEW

Vol. CXLVIII No. 3820 9TH FEBRUARY, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Contractors' Problems

APPREHENSIONS AND HOPES

STRIKING testimony to the standing of the Electrical Contractors' Association was given by the presence at the Association's annual dinner of so many leaders in other branches of the electrical profession and industry. At a time when the private installation contractor is faced with some tough problems this support should provide comfort and encouragement.

One major difficulty with which the contractor has to contend is the slackening of business caused by the combination of capital cuts, power shortage, restriction of public expenditure and reduction of available materials. Coupled with this is the increasing competition of the Electricity Boards. In times of normal expansion this could be regarded with greater equanimity, but in present circumstances it is not surprising that contractors are apprehensive.

Operatives' Aim

Another serious aspect is the attitude of the operatives. It is the stated aim of their trade union to encourage the Electricity Boards to extend their installation departments and eventually eliminate the contractor. What they hope to gain from this is not clear. If they think that they will secure greater permanence of employment this way we can only say that continued employment should depend on the will to work. The Boards should not provide shelter at the public's expense for the unwilling and incompetent.

Relations with Boards

Much was said at the dinner about the "Summary of Agreed Principles" by which relationships between the electricity supply industry and the contractors are now supposed to be regulated. Mr. R. A. Butler (Conservative M.P. for Saffron Walden) said that such an agreement could be violated successfully and with impunity. He questioned the adequacy of overhead charges debited by Electricity Boards to contracting work and also deprecated their hire-purchase schemes, first because they conflicted with the Government's desire to curtail domestic consumption and secondly because they gave terms with which no private contractor could compete.

Mr. Butler hinted at changes if there were a change of Government. We suggest, however, that it would be unwise for contractors to see in this the possible closing down of the Boards' installation departments. Electricity supply authorities were in this field long before nationalization.

Mr. P. G. Wallis, the E.C.A. president, did not say much about this competition but he did mention that well over 80 per cent of the " reputable " contracting work was carried out by E.C.A. members, which puts matters in a very favourable light.

Reference was made by Mr. S. N. Watkins (vice-president) to the happy relations existing between the B.E.A. and the Association. Sir Henry Self, on behalf of the B.E.A., gave an assurance of fair play and said that they were working to ensure that proper charges were made by the Boards for installation work. He asked the contractors to " banish the spectre of suspicion and mistrust." We are sure that all doubts will be resolved if the spirit which inspires the higher levels of the electricity supply organization permeates down to the local outposts and the contractors also do their part. It is in the public interest that the private contractor should be allowed to continue. Fair competition between him and the Boards will provide the checks and balances necessary to protect the consumers.

ELECTRICAL INDUSTRY'S EXPANSION

The information contained in the 1948 Census of Production reports is mainly of historical interest, for much has happened since then. It is clear, however, that the sections of the electrical industry covered by the latest report have undergone considerable expansion. Between 1935 and 1948 the number of manufacturing establishments increased from 522 to 855, the actual difference being rather greater, for Northern Ireland is excluded from the 1948 figures. In the same period and with the same qualification the number of employees rose by 104,655 to 253,612.

PRIORITY FOR POWER STATIONS

In announcing a reduction of 15 per cent in coal supplies to industry the Minister of Fuel and Power explained that this was necessary in order to keep the power stations running. Mr. Noel-Baker insisted that power stations used the same coal as industry, which is only partly true. Nevertheless it is satisfactory to know that the Ministry recognizes that every precaution must be taken against the interruption of electricity supply. The reduction of coal supplies to industry will inevitably lead to further electrical demands unless factory managements take special steps to prevent this happening. If they do not the situation will be considerably worsened.

DOMESTIC FUEL

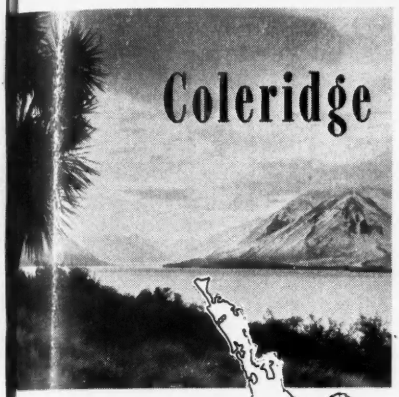
The Domestic Coal Consumers' Council is probably justified in saying that the inadequacy of supplies of coal for the domestic market is causing hardship. But it also contends that while supplies of coal for generating stations and gasworks have continued to expand in recent years the solid-fuel consumer has been getting less. Surely this is a natural process. If domestic gas and electricity consumption increases (as it continues to do) the result ought to be a corresponding fall in domestic coal requirements—a very desirable thing for several reasons.

VECTOR DIAGRAMS

One does not have to delve deeply into the literature of the subject to discover that a variety of different conventions are commonly in use for drawing vector diagrams to represent circuit conditions. Such diversity of practice can be confusing. The simple analysis presented elsewhere in this issue may possibly arouse considerable opposition among teachers of electrical engineering. It is nevertheless hoped that by calling attention to alternatives the article will encourage a more regular usage, if not general adoption, of the choice recommended by the author.

TRANSFORMER LOADING

While there is general agreement that transformers are conservatively rated, there is little evidence as to how much overloading is justifiable. Modern instruments measuring the hottest points of the oil provide useful indications of safe loading, but what is further required is evidence of the effect of overloading on the insulation and hence on the economic life. This entails consideration of such relationships as those between the hottest points of insulated conductors and of oil and between aging and ability to withstand short-circuits. There are in addition the difficulties presented by variations in design and in operating conditions (e.g. load cycles), but the value of an increase in the power/weight and power/space ratios makes the attention being paid to the possibilities well worth while.



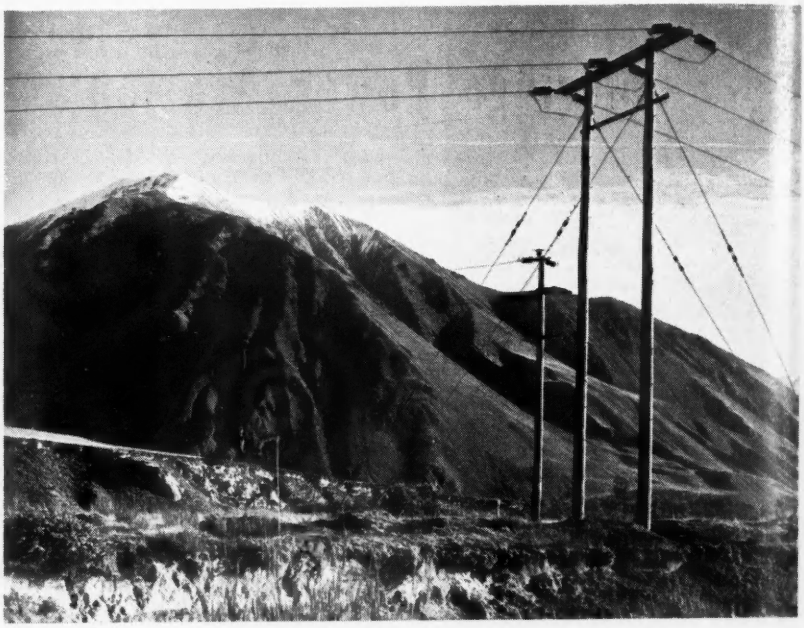
Coleridge Power Station

The First of Its Kind in New Zealand

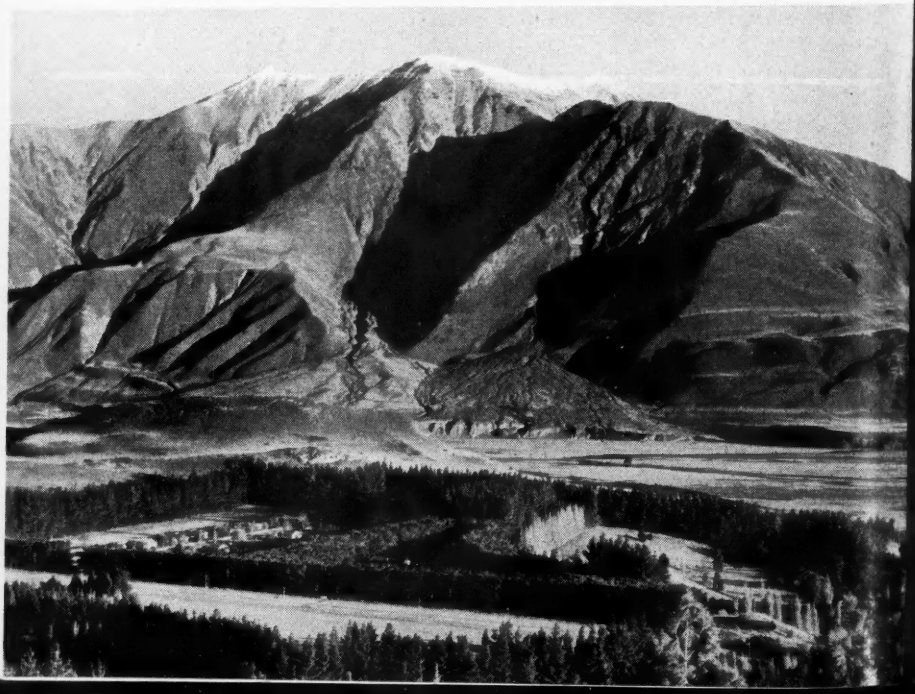
THE oldest of the State-built power stations in New Zealand is at Lake Coleridge, the waters of which have been used for generating power for almost forty years. This water power plant was originally built to supply electricity to Christchurch City and to Canterbury Province which, now celebrating the centenary of its foundation, was for a long time the most progressive and well-to-do although some movement of population has latterly taken place.

The Coleridge plant now delivers power

agnificent view of station and the tains beyond ake Coleridge



Transmission lines cross the Southern Alps into Westland and to the Hororata grid substation. Below : The village beneath Mt. Hutt in which the power house staff and their families live



Shingle groynes control entrances of the Rivers Harper and Acheron into the lake

into a distribution system that serves most of the South Island. The lake is twelve miles long and 1,670ft above sea level, magnificently set in a ring of sheer peaks which are snow-clad. The waters of the lake come from numerous mountain streams that rise in the Southern Alps and flow into the Harper and Acheron rivers. The natural courses of these rivers were changed to divert them from their original destination, the River Rakaia, and make them flow instead into the lake, the outlet from which is through pipe lines falling 500ft down to the power house below on the bank of the River Rakaia.

The capacity of the station is 34,500 kW and five power transmission lines radiate from it: two of them go over Arthur's Pass in the Southern Alps to serve the west coast area while three other lines go to a sub-station at Hororata and link up with the main South Island power-grid system.

Along the large shingle beds of the rivers in Canterbury Province there is a continual danger of flooding, so a system of groynes is maintained to control the waters of the Rivers Harper and Acheron where they flow into Lake Coleridge. During flood periods a close watch has to be kept on the inlet to the power house pipe lines to prevent blockages by shingle washed down the pipes.

Members of the power house staff and their families live in a small village, in the shadow of majestic Mt. Hutt. Theirs seems to be a lonely life to outsiders, but the small community has adapted itself to its surroundings and successfully countered the effects of isolation.

There is a school and a community hall which form centres for the social life of the residents. A farm supplies much of the produce needed and much work has been put into beautifying the surroundings by planting trees. A radio transmitting station has been established for emergency communication purposes in the event of unusually heavy falls of snow interrupting the normal telephone link with Christchurch City.

Electrical Contractors

Record Attendance at Jubilee Dinner

THIS year the Electrical Contractors' Association celebrates its golden jubilee and to this may be attributed the record attendance of nearly 800 at the annual dinner at Grosvenor House, London, W, on 30th January. The Rt. Hon. R. A. Butler, M.P., was the principal guest among a very distinguished company and Mr. P. G. Wallis, president of the E.C.A., was in the chair.

Mr. Butler proposed the toast of " The Allied Associations and Honorary Officials." In offering his congratulations to the E.C.A. on reaching its jubilee he said that he had brought a special message from Mr. Churchill. The Associations' aims were excellent; he referred particularly to the maintenance of high standards and to the educational and training schemes. He spoke of the esteem in which Mr. L. C. Penwill, the director and secretary, was held in the public life of the country.

Mr. Butler examined the " uneasy marriage " between the contractors and the B.E.A. and said that the " Summary of Agreed Principles " might be violated by either party with impunity and success. The method and extent of competition between nationalized and private industry was a vital question. Unfair and unregulated competition from a monopoly could ruin private contractors. So far it had not yet been decided what were reasonable and economic rates; the Electricity Boards' overhead charges appeared to be too low.

The Boards were still pursuing hire-purchase although the Government had appealed for economy and restriction of electricity consumption and better terms were offered than private enterprise could ever give. This unfair development was not in the national interest. Sacrifices were necessary from both contractors and the B.E.A. at the present time. The speaker considered that some decentralization and devolution was necessary in the electricity supply industry and if his party were returned to power there might be results of benefit to contractors.

Mr. Wallis responded to the toast, saying that the occasion justified his giving an account of the Association's progress since its beginning in 1901. In the course of his review he claimed that the organization was thoroughly democratic and fully representative of its members. Referring to the negotiated agreements with the operatives in the industry he expressed regret that the B.E.A. did not as yet wholly observe the established rates, rules and conditions. In dealing with the training of apprentices Mr. Wallis expressed the Association's concern that the operatives' union had demanded that only one apprentice should be employed to every five journeymen electricians as the apprentices' place could largely be taken by semi-skilled or unskilled mates; this would have a very adverse effect upon standards. He deprecated the ever-increasing lack of a will to work for work's sake, a condition made worse by the removal of initiative and ambition in the so-called " Welfare State."

In a reference to nationalized industries Mr. Wallis congratulated the B.E.A. on achieving what he believed to be a record in nationalization—a net surplus in each of its first two trading years. He paid a tribute to the help, advice and guidance which Mr. Penwill gave to the 3,000 members and then called upon Mr. W. R. Rawlings, the Association's first president, for a few remarks.

Mr. Rawlings expressed his pride in the growth of the Association. Mentioning that he was bordering on his eighty-eighth year, he said that of 35 past-presidents only 16 were still living. He thought that to-day's load shedding was possibly due to the Government's overlooking the efforts of the contractors in electrical development.

Mr. S. N. Watkins, in proposing the health of the guests, said that at no previous annual dinner had they had such a distinguished company. He referred to Mr. Butler's services to education. He regretted Lord Citrine's absence but welcomed Sir Henry Self, deputy chairman (administration) of the B.E.A., who had always been

fair and helpful in his dealings with the contractors. As Sir Archibald Gill, President of the I.E.E., was present he took the opportunity of appealing for a simplification of the I.E.E. Wiring Regulations. They looked forward to the day when the Regulations would be made compulsory. Mentioning the presence of four Area Board chairmen (Messrs. Randall, Nimmo, Howles and King), and Mr. E. R. Wilkinson and Dame Caroline Haslett (B.E.A.), Mr. Watkins thanked them for their courtesy and assistance. In conclusion he made brief reference to other guests, including the president and secretary of the E.C.A. of Scotland.

Replying to the toast, Sir Archibald Gill said that he realized how much the electrical industry depended on the work of the contractor. The Association's work in training apprentices was a matter in which the I.E.E. was very interested. He

At the Electrical Contractors' Annual Dinner

(1) Messrs. P. G. Wallis (president) and S. N. Watkins (vice-president). (2) Messrs. W. R. Rawlings (first president) and L. C. Penwill (director and secretary). (3) Messrs. W. H. Walton and T. E. Alger (past-presidents). (4) The Rt. Hon. R. A. Butler, M.P. (5) Messrs. F. J. Erroll, M.P., H. J. Randall (chairman, London Electricity Board), E. C. Holroyde (president, E.I.B.A.), J. G. Briggs (past-president) and E. R. Wilkinson (B.E.A.). (6) Mr. P. V. Hunter, Sir Henry Self (deputy-chairman, B.E.A.), Mr. W. R. Rawlings, Dame Caroline Haslett and the president. (7) Sir Archibald Gill (president, I.E.E.). (8) Messrs. S. Dickinson (past-president) and E. A. Mills (deputy-chairman, London Electricity Board). (9) Messrs. L. Howles (chairman, S. Wales Electricity Board), R. L. Booth (member, E.C.A. Council) and E. R. Wilkinson. (10) Messrs. A. E. Iliffe (E.L.F.A.), R. Smith (president, E.C.A. of Scotland) and E. C. Holroyde

would pass Mr. Watkins' suggestion that the Wiring Rules should be simplified to the chairman of the Wiring Rules Committee [Mr. P. V. Hunter, who was also present]. The Institution had decided against the compulsory registration of engineers, believing that it would result in a lowering of standards.

Sir Henry Self, who also responded to the toast, thought that it was time the marriage between the E.C.A. and the B.E.A. was consummated. The B.E.A. did not want to be looked on as a mother-in-law but as one of the parties to the marriage. He asked the contractors to banish the spectre of suspicion and mistrust. The B.E.A. was working to ensure that proper charges were being made and it intended to honour the agreement with the contractors.

The E.C.A. had collaborated with other associations, the B.E.A. and the Electricity Boards in the establishment of the National Inspection Council. He hoped they would help to make it a living success and thus raise the standards of installation work.

The health of the chairman was proposed by Mr. S. B. Fletcher and Mr. Wallis briefly replied.

New Cinematograph Regulations

NEW regulations governing electrical installations and equipment in cinemas came into operation on 1st February under the provisions of S.I. 1950, No. 2133 (H.M. Stationery Office, price 6d.). Provided that they meet the requirements of these new regulations in certain respects, existing installations need not be brought into full compliance until 1st January, 1953.

In the main, cinemas are required to be wired in accordance with the I.E.E. Wiring Regulations. Main transforming apparatus and switchgear for the electricity supply to the premises is not covered by the regulations, but it is required to be placed in separate enclosures which do not connect directly either with the auditorium or with any exit therefrom to the outside of the building. Apart from open type switchboards in rooms accessible only to authorized staff and where the supply voltage does not exceed 650 V, every main supply and main circuit must be controlled either by a handle-operated metal-clad circuit-breaker with excess current protection on all live poles, or, alternatively, by linked fuse-switches. Normal excess current protection requirements apply to all main and sub-circuits and, in addition to this, where the maximum earth fault current may be insufficient to operate fuses, etc., special earth leakage protection must be provided.

All wiring must be carried out in heavy gauge solid-drawn or welded screwed steel conduit or other hard metal sheathing having positively clamped or equivalent joints. Wiring protected by a lead or rubber sheath only or by capping and casing is not considered adequate.

Where luminous discharge tubes rated at more than 500 VA are installed, either inside or outside a building, normal methods of protection cannot be applied and special means must be provided for automatic disconnection from the mains in the event of short-circuit or leakage in excess of 20 per cent of full load current. Furthermore, no control apparatus for these lamps, including transformers, may be placed in the space between a ceiling and the floorboards above.

Special requirements are also applicable to rooms where film is handled. In the re-winding room, for example, all metalwork and apparatus used for re-winding must be bonded and efficiently earthed to avoid trouble due to static electricity and no other electrical apparatus, other than that used for lighting or heating, must be installed therein.

In the projection room all transformers must be double wound and an output limit of 20 kVA is imposed on each unit of converting equipment. Guards or enclosures on such apparatus must be so disposed that their temperature does not exceed 212 deg F. Means for individually isolating each projector and its converting apparatus from the mains must also be provided within easy reach of the operator and d.c. circuits installed after 1st February, 1950, for the excitation of loud speakers must not exceed 250 V.

Provisions are also made for the use of television equipment in cinemas in which the applied voltage is limited to 150 kV and prospective fault currents at voltages above 650 V to 1 A. Normal methods of protection against excess current are not applicable and automatic disconnection from the supply is necessary in the event of a short-circuit leakage current of 100 per cent above normal full-load value.

Electricity and Milk Production

THE South West Scotland Electricity Board in conjunction with E.D.A. is staging a dairy farming exhibit at the Scottish Dairy Show, at Kelvin Hall, Glasgow, from 13th to 17th February. The exhibit deals with electricity in dairy farming by way of two approaches. First the traditional display of equipment; and, secondly, the showing of E.D.A.'s latest films dealing with dairy farming.

Circuit and Vector Diagram Conventions

A Critical Examination

By M. G. SCROGGIE, B.Sc., M.I.E.E.

ONE does not have to examine very much of the literature in order to notice that a variety of different conventions are in use in connection with circuit and vector diagrams, especially in the notation for voltages. The result is ambiguity and risk of confusion. It is hoped that the following analysis, by comparing the existing alternatives and suggesting a generalized form of diagram, may encourage more consistent usages.

Three commonly used voltage notations are illustrated in Fig. 1. Any question about the sense of the current is excluded by adopting the generally-accepted convention that the direction of current flow corresponds to the movement of positive charges and is, therefore, opposite to electron drift.

To be unmistakable, a voltage notation must (1) identify the voltage, by indicating the points between which it exists, and (2) distinguish its sense, while to give meaning to the second of these there must be (3) an agreed convention as to which point (the one towards or away from which the voltage is directed) takes the sign of the value. That is to say, if the voltage exists between points *a* and *b*, in the sense *a*-to-*b*, it should be understood whether a positive value of the voltage means that *a* is more positive than *b*, or vice versa. In other words, whether a fall in potential is regarded as positive or negative.

The notation in Fig. 1 (a) satisfies the first requirement, but fails with the second and consequently with the third. This failure may be qualified, however, if one of the two points is earthed or otherwise clearly assumed to be at zero potential; a positive value for V would then presumably mean that the other point was relatively positive. But there is complete sense ambiguity for voltages between points neither of which can be regarded as being at zero potential.

The single-arrow notation (Fig. 1 (b)) is less clear in marking the terminals of the voltage, but does certainly indicate the sense, and could establish the polarity if the convention were known. It is just here, however, that the there seems to be most confusion. Some authorities would agree that for a positive value of V the arrow in this example is pointing in the right direction—from + to −. They would be working to the fall-of-potential convention. But if now an arrow were to be drawn with reference to the e.m.f. of the battery it could hardly point otherwise than in the

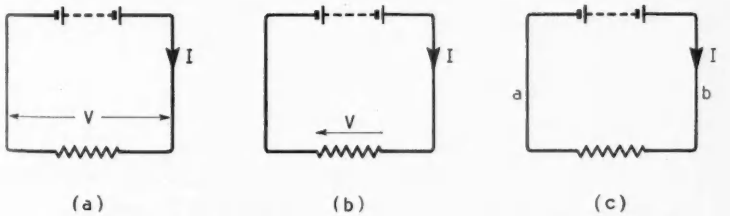


Fig. 1.—Three types of voltage notation: the double-arrow (a), the single-arrow (b), and the double-subscript; in the last of these, it is not necessary actually to write the voltage symbol on the diagram, as the lettering enables any voltage to be referred to in either direction unambiguously, as V_{ab}, or V_{ba}

direction in which E is tending to drive current (Fig. 2). Since V is numerically equal to E we now appear to have a total voltage equal to 2E tending to drive current clockwise round the circuit. If one reckons the voltages positionally instead of rotationally, the conclusion is no less absurd; voltages of opposite sense exist between the same two points. These anomalies are due, of course, to V and E being reckoned by opposite conventions; positive E being a rise in potential and positive V a fall. Since most people cannot easily regard the e.m.f. acting in the direction of the E arrow in Fig. 2 as being negative, the solution would seem to be to work throughout in rises of potential, which involves reversing the V arrow. But to many this also is unacceptable.*

Perhaps the real reason for this dilemma with the single-arrow notation is that although it could be used as a voltage notation of the kind now being discussed it often is used with a different significance—to indicate the direction in which a voltage is known to operate. On the latter understanding, Fig. 2 would be reasonable, for E operates in the direction *a* to *b* (that being the direction in which it tends to drive current), and V can be regarded as operating in the direction b to a (that being the conventional direction of the electric field). But the arrow direction obviously does not denote which terminal is positive; in this example arrows are pointing in opposite ways between the same pair of terminals.

To exclude ambiguity, therefore, it is better to discard both the double and single arrow systems in favour of the double-subscript notation. As Fig. 1 (c) shows, there is no need to write the voltage symbols on the circuit diagram at all. So long as all the junctions are lettered, the voltage between any two of them, and the sense in which it is meant to be reckoned, can be specified in the form V_{ab}. This denotes unmistakably the points (*a* and *b*) between which the voltage exists. There is no reliance on a tacit understanding that an unstated point is earth. That V_{ab} also implies the sense *a*-to-*b*, and V_{ba} the reverse, is unlikely to be disputed. The only uncertainty is the polarity convention.

The choice is between rise or fall in potential as positive. If falls are reckoned as positive, then a positive value of V_{ab}

* G.W.O.H., "A Strange Convention," *Wireless Engineer*, July, 1945, p. 365; correspondence, Sept., 1945, p. 442.

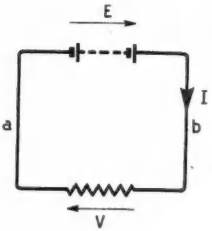


Fig. 2.—The single-arrow notation is apt to lead to inconsistencies

Fig. 3.—Lettering the vector to correspond with the circuit has practical advantages and leads to a generalized type of diagram

TABLE I.—THE "RISE" AND "FALL" CONVENTIONS COMPARED

	Rise	Fall
"V_{ab}" signifies potential	of *b* with respect to *a*	of *a* with respect to *b*
Positive V_{ab} means potential in direction *a* to *b* becoming	more positive	less positive
The sign of a voltage, when tracing round a loop, is (if an e.m.f.)	the same as that of the finishing terminal	the same as that of the starting terminal
Ditto (if across a resistance)	negative in the direction of the current	positive in the direction of the current
The direction of an e.m.f. is that in which it tends to drive current	internally	externally
If vector diagram is lettered to correspond with circuit points, it represents relative potentials of the circuit points	according to accepted convention (top being most positive)	oppositely to accepted convention

implies that *a* is more positive than *b*. And vice versa. In favour of the fall convention is its probable more general use. That may not be a logical argument, but it is a substantial one, because even an ill-chosen convention leads to no confusion if it is universally accepted and understood. Another advantage of the " positive = fall " convention is that it agrees with the conventional direction of the electric field. Also its positive direction is that in which current would flow through a passive path. The point of view is from the source of e.m.f. into the load. So it fits in with familiar statements such as that the current in a pure inductance is in phase with the voltage, that voltage being understood to be the voltage applied from some source elsewhere and not the e.m.f. being generated in the inductance itself.

In favour of the opposite convention of regarding rises in potential as positive it can be argued that it is more natural to do so: a positive movement normally suggests a rise rather than a fall. A fall is then a negative rise, and, in application of Kirchhoff's Second Law, the total voltage completely round the circuit is equated to zero. When the various impedances in a series circuit are being considered, it seems logical to treat the voltage across each as a function of that impedance—an opposing voltage—rather than as an earmarked portion of a single e.m.f. from some source elsewhere, destined for that particular impedance. In calculating a.c. circuits the most practical procedure is usually to work back from the current to determine the required e.m.f., rather than vice versa.

In valve circuits (especially) it is very usual for a source of voltage not to be a battery or a.c. generator direct, but the " drop " across an impedance: often a resistance. It is therefore convenient to imagine this resistance as if it were a source of back e.m.f. Although it is not really an e.m.f. the fact that a reactance is a source of real e.m.f., and that reactances and resistances are both reckoned in ohms and classed as current-opposing elements, does seem to afford an argument for such a convenient fiction.

From a teaching point of view there is something to be said for emphasizing the existence of the real e.m.f. generated by an inductance, and the fact that the current *leads* it, so that it is not sufficient to say automatically that the current lags " the voltage " without making sure which voltage it is.

At this unresolved stage it may be as well to turn to voltage vector diagrams. It must be realized that the arrow head at one end of a vector is merely the conventional device for indicating the rotating end, and any relationship to the direction of an arrow or other means used elsewhere to indicate the sense of the voltage is purely coincidental. Nevertheless, if the two were to agree it would be a mental aid. Likewise with the relationship between the ends of the vector and the terminal points of the voltage in the circuit.

It will be assumed that the purpose of each voltage vector is to represent the voltage of one point with respect to another —commonly a point of zero potential. It is logical therefore to look on the motionless end of the vector as representing the zero-potential point in the circuit. For example, if the vector in Fig. 3 represents the voltage between points *a* and *b* in a circuit, *a* being an earthed point, then the perpendicular distance from the end of the vector marked *b* to the horizontal axis through *a* represents the instantaneous potential of *b* in the circuit, just as the constant zero height of end *a* above itself represents the zero potential of *a* in the circuit. It would be convenient if the arrow pointing from *a* to *b* in the vector diagram represented the voltage from *a* to *b* in the circuit; that is to say, V_{ab}. On that understanding, a positive value of V_{ab} would necessarily mean *b* positive relative to *a*. On the contrary or " fall " convention, the uppermost point in the vector diagram would paradoxically represent the lowest potential in the circuit.

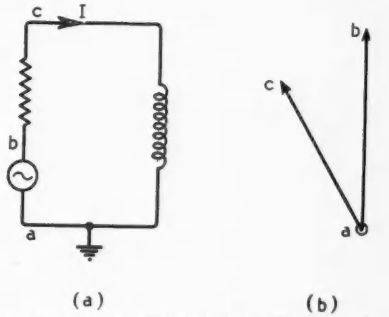


Fig. 4.—A simple circuit (a) with its voltage vector diagram on the lettered system (b)

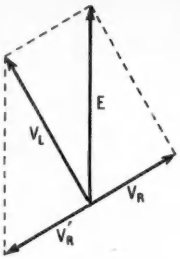


Fig. 5.—An example of the ambiguity of a common type of vector diagram representing Fig. 4 (a)

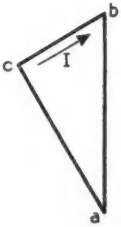


Fig. 6.—Generalized diagram for Fig. 4 (a)

Fig. 4 (a) is a simple example of a circuit, and (b) its vector diagram at the instant when the e.m.f. is at its positive maximum. With either convention it would be agreed that this means that point *b* would be at its maximum positive potential. But whereas the "rise" convention would call this e.m.f. V_{ab}, the "fall" convention would have to call it V_{ba}—a direction opposite to that of the vector arrow. Note that lettering the vector to correspond with the circuit makes it unnecessary to mark either diagram with the voltage symbol.

The sinusoidally-varying potential of point *c* (with respect to *a*) is similarly represented by the vector *ac*.

The voltage across the resistance is the real test of a vector diagram, because neither of its terminals is at zero potential. The logical continuation of the foregoing procedure would represent this voltage by a line joining *cd*. But if it is regarded as a vector, which way ought it to point? The object of the arrow head being to distinguish the rotating end from the pivot end, then it should be attached to neither or both. Yet vector diagrams are commonly seen with such arrows pointing one way or the other. This suggests that the arrow is really being used to distinguish V_{cb} from V_{bc}, rather than the rotating end from the fixed end.

The ambiguity of direction here is accentuated if (as is often seen) the vector representing this voltage is shown radiating from the same centre as the others, to which it is related by "completing the parallelogram." For with this system one person might show it as V_R in Fig. 5, and another as V'_R pointing in the opposite direction. Either might be right, according to the point of view. But this practice obviously invites confusion, especially in complicated circuits. And of course it completely rules out the convenience of lettering.

In this example, one point in the circuit is earthed, and is appropriately represented in the vector diagram by a fixed point. But if no point is earthed and none is expressly specified as the reference point, the purpose of the arrow heads disappears. The lettered corners of the line diagram (now not a vector diagram in the strict sense) are sufficient to exclude all ambiguity, and the voltage situation is represented comprehensively with maximum economy of effort and symbolism, and with complete generality (Fig. 6). With this type of diagram one can see at a glance the potential of every circuit point with respect to all the others. Any point can be chosen temporarily or permanently as a zero-potential point and the varying potentials of the other points represented by rotating the diagram about it. If permanently, the choice can be indicated by affixing arrow heads to all the others, pointing away from it, so converting the figure into an orthodox vector diagram.

So far as relative potentials are concerned, and so long as the voltages are not actually named, even a lack of agreement about the "rise" or "fall" convention cannot introduce ambiguity. But indicating the relative phase of the current is normally an important part of the vector diagram's duties. There is no doubt that in Fig. 6 the current vector would have to be parallel to *cb*. To preserve the generality of the diagram it would best be drawn detached, only being attached to one corner if that corner was to represent zero potential. When the current flowing in the direction of the arbitrary arrow in Fig. 4 is positive, then point *b* must be positive with respect to *c*. The I arrow to be inserted in Fig. 6 must therefore point in the same direction as *c* to *b* on the voltage diagram. If this is taken to represent the voltage in the direction *c* to *b* in the circuit diagram (conventionally referred to as V_{cb}) then one is bound to conform to the potential-rise convention. This voltage can be regarded as the opposition offered by the resistance to the current, or, if the idea of the current being 180 deg out of phase with the voltage across a resistance does not appeal, V_{cb}

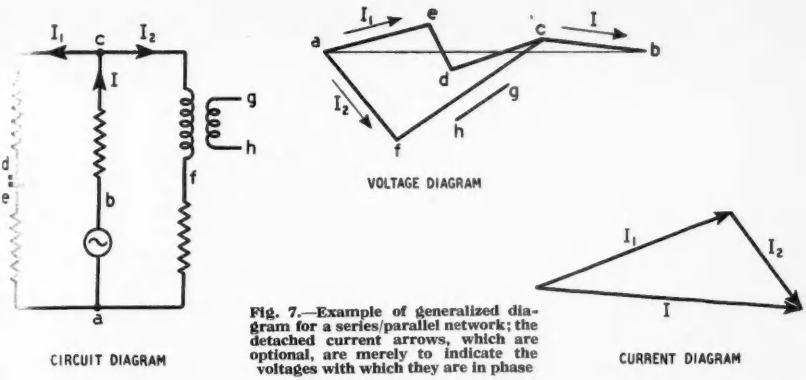


Fig. 7.—Example of generalized diagram for a series/parallel network; the detached current arrows, which are optional, are merely to indicate the voltages with which they are in phase

can alternatively be regarded as the voltage applied to the resistance by the part of the circuit from *c* to *b* in the same direction as the current, i.e., the " long way round."

The only way in which this diagram technique could be made compatible with the " fall " convention would be to reverse the sense convention in the double-subscript notation; that is to say, interpret " V_{cb} " as " the voltage in the direction *b* to *c*," which would be unlikely to please anybody.

If a voltage vector diagram is regarded as showing the alternating voltages with respect to a specified point in the circuit, a current vector diagram correspondingly shows the alternating currents in specified directions. In a purely series circuit, the voltages are together represented by a closed figure, and there is one common current, whose vector is usually shown attached to the corner corresponding to the specified circuit point; but in the generalized diagram it is better detached. To give this current vector an unambiguous meaning, current direction must be indicated on the circuit diagram. It would be a good thing if current vectors and arrows were universally distinguished in some standard manner, say by a thick arrow head.

In a purely parallel circuit, the currents are together represented by a closed figure (if all the current arrows in the circuit diagram are made to point towards—or away from—a single point) and there is one common voltage.

Series and parallel groups forming parts of a complicated circuit are linked together by the common voltage and common current, so a complete vectorial picture can be built up. Usually all the voltage and current vectors are lumped together in one diagram, but this often obscures the interpretation.

Fig. 7 is an example of the generalized diagram. The voltage part of it shows, for instance, that at the moment when the generator e.m.f. is zero, at the start of its positive half-cycle, the current I_2 is negative and therefore flowing anticlockwise. The potential of point *f* is negative with respect to *a*. This p.d. is due to the negative e.m.f. (*cf*) generated by the inductance of the transformer. The secondary e.m.f. is shown by *gh*. At the same time the *e* terminal of the capacitor is positive to *d*, and its discharge is driving a positive current I_1 (anticlockwise). Point *f* is negative to *d*, and at the moment there is very little p.d. between *b* and *d*, but quarter of a cycle later it will be quite large.

These are examples of facts that would be less clearly shown by the type of vector diagram in common use.

Increased Service Charges

BECAUSE of higher costs of materials and labour the North Western Electricity Board is to increase service charges for the installation of electricity. There will be a connection charge of £2 10s and a charge of 12s 6d for underground cable or 5s a yard for overhead line once it has entered the new consumer's property. The charges will be lower if the consumer intends to install electrical appliances which will bring the Board revenue in addition to that accruing from the use of electric lighting and radio.

VIEWS on the NEWS

By REFLECTOR

IT seems to me that anybody employed in digging holes and trenches in historic areas should be tutored in the elements of archaeology. The story is told in "Contact," the magazine of the Merseyside & North Wales Electricity Board, of the recent discovery of Saxon silver at Chester, by men engaged in laying a cable there. In the course of their work they found, 18in below pavement level, some discs. Some of these were kept as curiosities and the trench was filled. Eventually some of the discs came to the notice of a schoolmistress who took them to the curator of a local museum. They were identified as coins dating from Edward the Elder (900–925) to Edgar (959–975) and when the trench was reopened a total of 458 coins and some silver bars were recovered.

* * *

From time to time the *Electrical Review* has drawn attention to the freedom of landlords of blocks of flats to charge what they like for the electricity which they supply, at second hand, to their tenants. At a meeting of the North Western Electricity Consultative Council it was said that there had been cases in the Area in which tenants had been charged up to 700 per cent more than the Board's rates. The Council decided to press for legislation to make this impossible, as was the case with gas supplies.

* * *

Fine distinctions have to be made when it comes to the interpretation of Government Orders. At Nottingham the question "What is a public clock?" has been raised in connection with the application of the display lighting restrictions. A correspondent of the *Nottingham Evening News* was told by an official of the Ministry of Fuel and Power that a town hall or church clock ranked as a public clock but clocks on business premises, whether they bore the name of the firm or not, were indirectly advertising and as such were banned. Another official said that there was no hard and fast rule. "Each case was treated separately. An official inspected the clock before a decision was made."

* * *

On the same day as Mr. Noel-Baker announced that the pithead price of coal was to be increased by 4s 2d a ton I read a note in an overseas paper that in South Africa coal is being delivered to two pithead power stations at a cost of 4s 9d a ton. Even when full allowance is made for the very different conditions existing in South Africa, it seems fantastic that this last increase in the British price approaches the total cost of South African coal.

* * *

A solution of the power shortage problem is propounded in a recent letter to the *Shrewsbury Chronicle*. It is that "all mills now existing whose power is developed by wind or water, be requisitioned by the Government principally to develop electricity." The writer asks all people in Shropshire to supply particulars of these mills and he will then "ginger up" his Member of Parliament and "the powers that govern us." Alas, I fear that nothing will come of it and power cuts will continue.

* * *

Our reputation as a nation of sportsmen is being maintained in spite of everything. While train services are being cut, special trips to football matches are being arranged. And while lighting is being restricted, the Manchester United Football Club (according to the *Evening Chronicle*) has played a test game by floodlight.

* * *

Americans must have gained some idea of the seriousness of the power position in Great Britain when they were informed by the *Electrical World* (New York) that "in Bournemouth, England, department stores have hired extra detectives to guard against shoplifting during power blackouts."

PERSONAL and SOCIAL

News of Men and Women of the Industry

WE are informed that **Mr. A. L. Fielding,** M.Inst.C.E., M.I.E.E., A.M.I.Mech.E., advisory and inspecting engineer for the New South Wales Government, has relinquished his appointment as official representative in London for the Snowy Mountains Hydro-Electric Authority of the Australian Commonwealth Government, owing to pressure of work for the State Government. He will continue to act as consultant to the Authority, whose business is now being conducted from 1, Regent Street, London, S.W.1. Correspondence should be addressed to the "Engineer-in-charge" at that address.

Mr. C. Pitcher, London manager of Premier Electric Heaters, Ltd., has recently retired after thirty-nine years' service with the company. Mr. Pitcher joined the company in 1912 when the electric heating industry was still very much in its infancy; he had previously been associated with the British Prometheus Co., Ltd., at Kingston-on-Thames from 1903, thus making a total of forty-eight years on the heating and cooking side of the industry. **Mr. S. E. Whorton** (formerly representative in the London area) has been appointed London manager in succession to Mr. Pitcher.

Mr. D. Z. De Ferranti has resigned from the board of Ferranti, Ltd., and relinquished his position as general manager of the company.

Mr. R. F. Burston, A.M.I.E.E., has been appointed commercial officer for the Eastern Sub-Area of the South Wales Electricity Board and takes up his duties at Newport on 1st March. Mr. Burston became senior assistant Sub-Area commercial officer in 1948. Previously he served with Stockton-on-Tees Corporation (as chief assistant electrical engineer), Greenock Corporation, the North Wales Power Co., and Wolverhampton Corporation.

Mr. E. Loynes, A.M.I.E.E., divisional chief electrical engineer of the North-Western Division of the National Coal Board, is a member of the Mining Productivity Team which sailed in the *Queen Mary* on 31st January to study productivity in the coal industry in the United States.

Mr. H. Roberts, commercial officer of the Bridlington District of the Hull Sub-Area, Yorkshire Electricity Board, has been appointed to a similar position in the Bracknell District of the Southall Sub-Area of the Southern Electricity Board. Before nationalization, Mr. Roberts was chief commercial assistant with the Buckrose Light & Power Co., Ltd. Earlier he was with the Basingstoke, Skipton and Colwyn Bay undertakings.

Mr. H. Renshaw, principal secretarial assistant at the North Western Electricity Board's No. 3 Sub-Area headquarters, has been appointed Sub-Area secretary in succession to the late Mr. F. Sharpe.

Mr. T. H. R. Perkins, only son of Mr. F. Perkins, chairman and managing director of F. Perkins, Ltd., has been appointed a director of the company.

Mr. Charles Stafford has been obliged by ill-health to resign his post as general manager of Leicester City transport undertaking. The Council has appointed **Mr. John Cooper,** general manager of Northampton Corporation Transport Department, to succeed Mr. Stafford at a salary of £1,700.

Mr. I. Lockwood has retired from the position of district engineer, West Ham, London Electricity Board. At a recent farewell dinner, Mr. J. W. J. Townley, C.B.E., M.I.E.E. manager, North Eastern Sub-Area, London Electricity Board, presented Mr. Lockwood with a gold watch from his colleagues and friends. Speakers recalled that he had spent 42 years in the supply industry and had occupied various mains appointments with the Huddersfield, Kent Power Co., West Ham and Sunderland undertakings. He was distribution superintendent at West Ham from 1945 to 1948.

Mr. N. I. B. Harrison, A.M.I.E.E., has been appointed manager of the Lighting Department of Cryselco, Ltd. **Mr. J. V. Walshaw** has joined the company's illuminating engineering staff at Bedford.

This year 113 employees of **W. T. Henley's Telegraph Works Co., Ltd.,** have received gold wristlet watches presented by the company in recognition of their long service. Male employees qualify for these awards on completing forty years with the company, whilst for female employees the qualifying length of service is thirty years. Sir Montague Hughman, chairman of the Henley Organization, recently presented the watches to the recipients at the company's head offices and works.

The third annual dinner of the **Telcon Staff Association** (Telegraph Construction & Maintenance Co., Ltd.), was held on Friday last at Pyne's Restaurant, Lewisham, about 150 attending. The toast of the company was proposed by Mr. S. Seaman (Power Cables Department), who mentioned that the company celebrated its centenary last year and the fact that it had been in existence for 100 years showed it was sound and that its directorate and management was also sound.

Mr. W. F. Randall (director), who responded, said that in these days the company was concerned with a diverse range of manufacture, but they were still specialists in submarine cables on which the company's reputation had been built. He said that he had been a member of the staff for twenty-five years and he therefore knew that the strength of the company was the strength of the staff.

In proposing the toast of the Staff Association, Dr. E. W. Smith (director of the associated company, Submarine Cables, Ltd.), said that much was heard nowadays of such matters as productivity, apt to be associated only with manual workers. The staff was perhaps kept on the edge of the limelight beam. The manual worker, however, could only do his work with staff planning behind him. He referred to the value of the social activities of the Staff Association and the good work of the Association Council. Mr. F. Leighton (chairman, Staff Association), in reply, read messages of good wishes from Lord Colgrain (chairman of the company), and Mr. J. N. Dean (managing director), who were unavoidably absent.

On 27th January, in the clubroom of the **Benjamin Sports and Athletic Club,** the children's annual party was held when 300 children were entertained. Tea, ices, and the usual refreshments were provided, followed by Punch and Judy, conjuring, and a children's talent competition.

The annual staff dinner and social of **Flinders (Wholesale), Ltd.,** was held at Ipswich on 24th January, about seventy members of the staff attending, together with the four direcors of the company, Messrs. H. S. Seccombe (chairman), C. C. Scott (managing director), A. T. Haywood and H. Lyon. During the evening, Mr. Scott, on behalf of the company, made a presentation to Mr. A. Wright of an armchair in recognition of his completion of thirty-five years of continuous service. A presentation was also made by Mr. Lyon on behalf of the staff to Mr. Scott, who has completed twenty-five years' service with the company. A toast to the parent company was proposed by Mr. A. W. Dace, secretary, to which Mr. Seccombe and Mr. Haywood responded.

A buffet dance recently held at Bush House Restaurant by the Social Club of Nalder Bros. & Thompson, Ltd., was marked by the presentation to **Mr. A. B. Gibbons**, A.M.I.E.E., director and secretary, on the occasion of his retirement, of an illuminated address and a television receiver from the directors, and a radio-gramophone from the employees. The presentation was made by Mr. A. G. O'Neill, M.I.E.E. chairman and managing director, and Mr. D. W. Nalder, director and secretary, was also present. Mr. Gibbons entered the service of the company 45 years ago, eventually rising to chief draughtsman and assistant general manager. He was appointed director and secretary in 1935.

At a meeting of the North Western Electricity Board on 22nd January, the Chairman's Cup, which goes to the winner of the Board's annual service centre window display competition, was presented to **Mr. John Cobham**, whose display at Hyde (Cheshire) was adjudged the best.

About 600 members and friends met at the **B.T.H. (Willesden) Long Service Association's** fifth annual reunion at Wembley Town Hall on 1st February. During the evening Mr. E. H. Ball (managing director, B.T.H. Co.), who was welcomed by Mr. E. Alexander (chairman of the Association), presented long-service certificates to 45 members. Part of the evening was spent in dancing and there was a variety cabaret. Mr. W. A. Forster was M.C.

A former Lancashire Dynamo & Crypto apprentice, Mr. C. G. Abbey, now president of Bepco, Canada, Ltd. (an associated company of L.D.C.), has given a shield to be presented yearly to the apprentice in his old company who gains the best Ordinary National Certificate pass. The first to receive this "Abbey" shield was **Mr. C. Holmes** who was presented with it at the annual dinner of the College & Technical Apprentices' Association on 12th January. At this dinner, which was presided over by Mr. A. W. A. Dick-Cleland (Trafford Park Works) and Mr. D. C. Lorkin (Willesden Works), joint managing directors, 126 apprentices and parents were present. During the evening entertainment was provided by the apprentices and other prizes won during the year were presented, including the "D-C" cup to **Mr. A. Gorton,** the best all-round apprentice.

The first annual ball organized by the Hants & Dorset Branch of the **Electrical Industries Benevolent Association,** in conjunction with the Southern Division of the British Electricity Authority was held on 26th January at the South Parade Pier Pavilion, Southsea. It was attended by nearly five hundred people who spent an enjoyable evening dancing to Sim Grossman's band. A cabaret and prizes were additional attractions. Principal guests, who were welcomed by the chairman of the branch, Mr. R. H. Coates, Divisional Controller, Southern Division, included Alderman Sir Denis and Lady Daley,

Lord Mayor and Lady Mayoress of Portsmouth, Mr. E. C. Holroyde, president, E.I.B.A., and Mrs. Holroyde, Mr. L. C. Sharp, chairman of the Court, E.I.B.A., and Mrs. Sharp, Mr. H. Nimmo, chairman, Southern Electricity Board, Mr. R. R. B. Brown, deputy chairman, Southern Board, Vice-Admiral W. Y. La R. Beverley, Admiral Superintendent, Portsmouth Dockyard, and Mrs. Beverley, Rear-Admiral F. S. Billings, manager, Engineering Department, Portsmouth Dockyard, and Mrs. Billings. During the evening it was announced that £275 had been raised for the Association's funds.

OBITUARY

Sir Arthur Preece.—Sir Arthur Henry Preece, LL.D., M.Inst.C.E., M.I.E.E., who died on 31st January, was the second son of the late Sir William Henry Preece, K.C.B., F.R.S., a former president of the Institution of Civil Engineers. He was born in 1867 and received his early education at private schools, at King's College School, and in Germany. He later studied at King's College, London, and then joined Elwell Parker (later the Electric Construction Co., Ltd.) at Wolverhampton as a pupil. In 1889 and 1890 he acted as assistant engineer in the erection and running of the Rathbone Place station of the Metropolitan Electric Supply Co. and subsequently (in 1891) he joined Dr. Gisbert Kapp's staff in Westminster, where he was employed in the preparation of the plans and specifications for the Bristol station. In 1893 he opened an office in Victoria Street, London, as a consulting electrical engineer, and was responsible for the design and construction of many of the early electric generating stations including those at Hammersmith, Wimbledon, Llandudno, Kingston-on-Thames, Gibraltar and Malta. In 1898 he received the Telford Medal and Premium from the Institution of Civil Engineers for a paper on "The Electricity Supply of London."

The late Sir Arthur Preece

In 1899, on the retirement of his father from the post of engineer-in-chief of the General Post Office, the practice became merged in the newly formed firm of Preece & Cardew. During the first thirty-five years of the century, he visited many of the Crown Colonies, the Far East and South America. Sir Arthur Preece was early convinced of the benefits to be obtained from adequate and efficient supplies of electricity in the Colonies, and he devoted considerable attention to this work. His services were recognized in 1932 when he was knighted. For some years Sir Arthur Preece had suffered from failing eyesight, and on his doctor's advice he retired from active work in 1949. He is survived by his wife and three daughters.

Mr. Harold Herbert Parker, who has died at Pudsey, Yorkshire, at the age of sixty-five, was district manager for the Yorkshire Electricity Board until his retirement last October. He had previously been borough electrical engineer of Pudsey for 28 years.

Mr. C. B. Nadaud.—The death occurred recently of Mr. Charles B. Nadaud who, until his retirement in 1948, was Northern Area sales engineer to the Northmet Power Co. Mr. Nadaud was educated at Dulwich College and received his training at Finsbury Technical College. He was for some time with Abell & Smith, Ltd., electrical contractors, Worcester, and then went to the West Kent Electric Co., later joining the Northmet Co. as a sales engineer.

Mr. C. W. Jackson, who was senior executive officer, King's Lynn (Norfolk Sub-Area, Eastern Electricity Board), until his retirement in January, 1949, died on 28th January at the age of sixty-seven. Mr. Jackson joined the King's Lynn electricity works in 1905.

Diesel-Electric Locomotives

TOWARDS the end of 1946 the Southern Railway decided to build three 1,750 b.h.p. diesel-electric locomotives for express passenger service; the first has recently been completed. This project originated a little before the L.M.S. Railway Co. also decided to build two similar locomotives. The designs made by each company were prepared independently to suit its particular requirements, the Southern Railway locomotives being for passenger working only, while those on the L.M.S. Railway were for mixed traffic working.

In both designs the power equipment has been supplied by the English Electric Co., Ltd., and is the same in the main items, there being only small differences in the control system and in the gear ratio of the traction motors. The design of the mechanical portion of the locomotives was under the control of the chief mechanical engineer, Mr. O. V. Bulleid, until his retirement in 1949, and the power equipment was similarly dealt with by the chief electrical engineer, Mr. C. M. Cock, until he took an appointment with the Railway Executive. Subsequently, the control of the whole locomotive came under Mr. S. B. Warder on his appointment as mechanical and electrical engineer, Southern Region, in 1949. Both the design and the construction have been carried out at the Ashford works of the Southern Region.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Power Factor

IN the current issue of your journal under the heading "Power Factor Again" you state (p. 208):—". . . the report on 'Electricity Supply' published by the Anglo-American Council on Productivity does not reveal anything about American practice in this regard . . ."

Para 273 of that report reads as follows:—"Extensive use is also made of synchronous conditioning plant on interconnectors as well as long transmission lines, particularly under conditions such as those arising (*a*) when generation is at some distance from the load centre, (*b*) when a system is beginning to get overloaded, and (*c*) when the power factor gradually falls below the value for which the generating plant was specified and the system designed, due to load expansion developing progressively further away from the generating centre.

"The Americans consider that, where a system is being reorganised into self-supporting load areas, it is cheaper to purchase reactive capacity in the generating plant while keeping to simplicity of design. This coincides with British opinion, but possibly the factors outlined previously are worthy of inspection. . . ."

C. C. BARNES.

Ilford, Essex.

"Unshared Burdens"

WITH reference to the leaderette bearing this heading, appearing in your issue of 12th January, I would point out that the Irish Electricity Supply Board has (or had) a scheme for refunding some proportion of a capital contribution covering a line to which other consumers are subsequently connected within a specified period. Probably the chairman of that Board would be willing to supply details of the scheme to interested parties in this country.

Roby, nr. Liverpool. L. J. ARCHER.

E.A.W. Activities

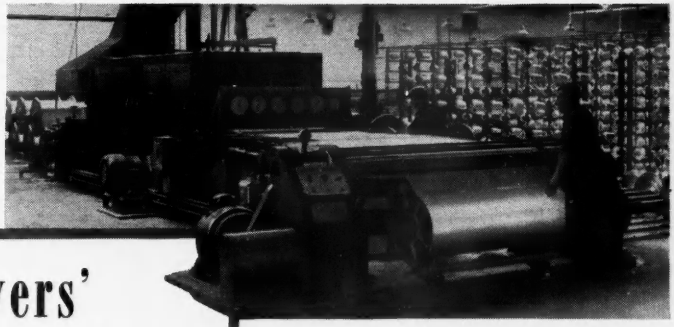
New Branch at Darlington

AT the first examination for the new E.A.W. certificate for electrical sales assistants there were 42 successful candidates, including five men. The examination is open to those over 17 who have had one year's experience in a showroom or other commercial organisation. It was instituted to meet the need of those who were ineligible for the certificate examinations for demonstrators and saleswomen, and for fully qualified teachers.

The Councillor Miss Walter Rose Bowl has been awarded for 1950 to the Whalley Range High School for Girls, Manchester, for the second year in succession. The runner up was the South East Essex County Technical School, Dagenham.

Dame Caroline Haslett outlined the aims and achievements of the Electrical Association of Women at a meeting at the Technical College, Darlington, last week to inaugurate the Darlington Branch, the president of which is Lady Starmer. Councillor Mrs. M. Lyonette presided, and other speakers were Mr. T. E. Daniel, deputy chairman, North Eastern Electricity Board, Mr. C. E. Beynon, principal of the Technical College, and Miss Norah Balls, member of the North Eastern Electricity Board.

Mrs. M. L. Pearce, senior demonstrator in the Bristol and North Somerset Sub-Area of the South Western Electricity Board is the holder of the sixth Caroline Haslett Trust Travelling Exhibition, under which she recently visited France to find out what the Frenchwoman thinks of electricity, and to what extent she uses it. On 29th January Mrs. Pearce gave a lecture at the Institution of Electrical Engineers, London, called "Electricity and the Frenchwoman," in which she reviewed the French housewife's attitude towards domestic electrical apparatus and the economic circumstances which so largely govern domestic electrification.



Weavers' Thread Sizing

Variable-Speed Drives

The new comprehensive sizing and drying plant shown in the title illustration is of outstanding electrical interest and exerts great influence on the weaving operations; hot air fan drive left of drying chamber

IN our last issue we described the conversion from mechanical to electrical driving of the cloth-making section of the textile works at Forfar of John Lowson Jnr. & Co., Ltd. This modernization scheme has involved the provision of entirely new textile plant throughout, and of this new and comprehensive installation the sizing and hot-air drying plant and its associated size-preparation equipment are of such outstanding interest electrically, and exert such great influence on the weaving and other operations in the factory, that we deal with them separately in this article.

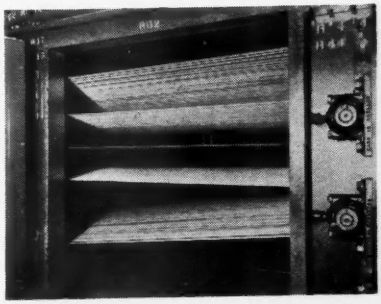
To mention the major machine group first, i.e., the actual sizing and drying plant: this is essentially a self-contained continuous flow-line production installation involving in correct sequence unwinding from warpers' reels, sizing, hot-air drying, moisture-content determination and measurement, and rewinding on the loom beam (warp).

This Joseph Hibbert plant occupies a floor space of about 60ft by 10ft and the maximum height is about 8ft. From two to eight warp reels, the number varying according to the fineness or thickness of the cloth to be manufactured, are carried on a creel frame at the back of the machine group.

The diameter of the warp reel flanges is 30in, as against the 18in of the reel flanges employed in the replaced equipment referred to in our earlier article, while the actual barrel diameter is 10in, as against 4·5in in the case of the older equipment.

Thus very much longer runs of thread are obtained from the new reels, and the threads are run off more uniformly, even down to the barrel. In the older methods of reel unwinding a comparatively great deal of trouble was experienced when nearing the end of the runs, resulting in broken threads which the operative had to piece up in the course of dressing, causing

Threads pass to and fro over rollers inside the drying chamber



a considerable loss of production. This loss is now practically negligible.

The threads from each warp reel pass under and over each of the other reels in front of it until all the threads are brought to the front of the creel where they are first passed over a top roller which is a trifle smaller in diameter than a bottom roller under which they next pass; thus there is slight tensioning between the two rollers. The bottom roller, and hence the threads as they pass under it, are actually submerged in size, in the size box, and this is the essential difference between the old and new methods of applying the size.

While still in the size box the threads pass between two rollers, the top one of which is covered with flannel, so that the surplus size is squeezed out. The size is steam heated, and its temperature is maintained constant by thermostatic control. The heating is effected by circulating the size through a steam-heated coil, for which purpose there is a 1 h.p. 1,430 r.p.m. E.C.C. motor-driven pump under push-button control. The transmission is a single-stage V-belt scheme with a 3-to-1 ratio speed reduction.

Immediately in front of the size box there is a wet split rod which separates the threads, and then the threads enter a steam-heated thermostatically controlled drying chamber. This measures about 20ft by 10ft by 4ft high, and through it hot air is circulated by a 10 h.p. 1,440 r.p.m. E.C.C. motor, under push-button contactor control, driving a fan under the chamber through a single-stage 3-to-2 ratio V-belt transmission to the fan shaft.

The threads pass to and fro, from end to end, over a series of rollers inside the chamber until finally they pass out of the chamber at the front and then immediately into a cooling unit which constitutes the fresh-air intake for the heating and fan equipment. Immediately after the threads are cooled they pass over and under a couple of rollers and then a representative section of the threads passes between the electrodes of a Fielden " Drimeter " which measures the moisture left in the threads, superseding the old " feel by hand " method. The measurement is effected electronically, the current passing between the electrodes, i.e., cross-sectionally through the threads, being supplied through suitable valves and varying according to the moisture content of the threads. The current is continuously recorded on a meter in terms of moisture content.

A telescopic wraithe spreads out the threads to the required width of the weavers' beam and they pass straight on to the draw roller in the headstock of the machine group. The power required for unwinding the reels on the creel at the back of the machine is provided by the draw roller at the far end of the machine group. This roller is driven by a 3 h.p. 240 V, 520/1,560 r.p.m., d.c. motor. Thread speeds at the beam are required within the wide limits of 5 yd and 80 yd/minute, hence the adoption of d.c. for the drive as well as for the beam drive to be referred to later.

The transmission to the draw roller is by chain to a gear box which has a final-shaft speed range of 108/8 r.p.m. This final shaft is directly coupled to the draw roller. From the motor there is also a transmission back to the size roller through a P.I.V. chain-gear unit with a 2-to-1 speed ratio.

The draw roller is distinct from the actual beam which is also driven by a d.c. motor (0·75 h.p. and 3,000 r.p.m. maximum) *via* a pinion train with a final-shaft connection direct to the beam shaft. The beam motor runs at such speeds in relation to the draw-roller motor as to create a tension on the threads between the draw roller and the beam, thus ensuring a firmly built-up beam, which facilitates operations on the loom.

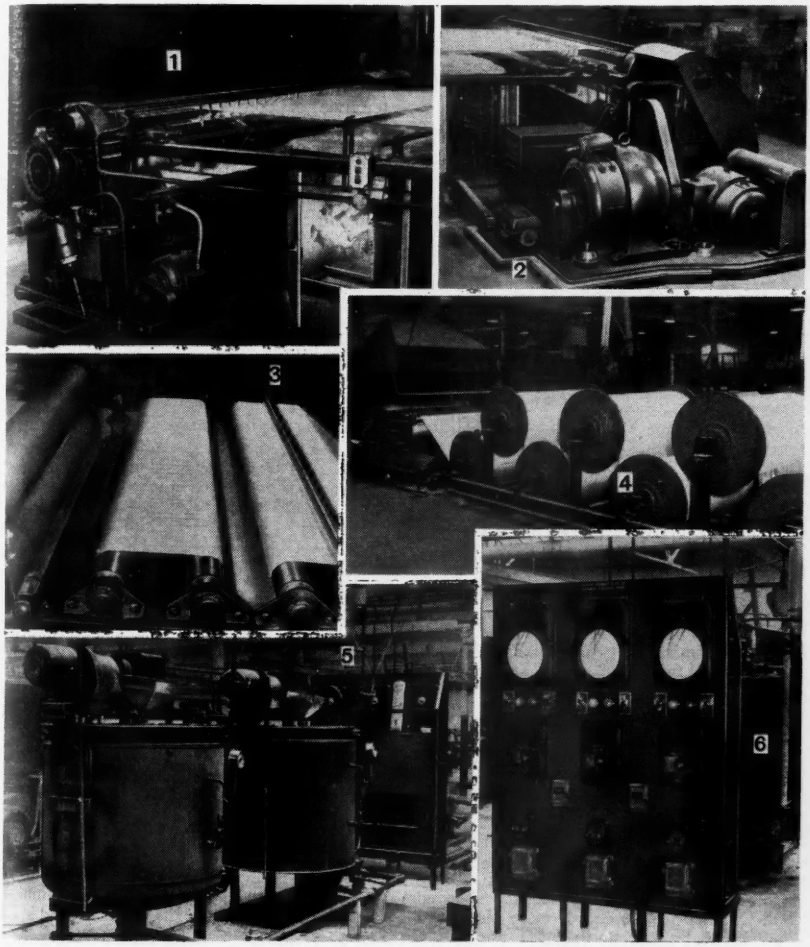
The dual or joint control scheme for the draw-roller and beam motors is of exceptional interest. On the control panel on the front of the machine headstock there is provision for crawl and run speed ranges, controlled by start and stop push-button contactors. On the run range there are three different major speed settings and the motor speed can be infinitely varied within the prescribed limits of each setting by rheostatic control. The control of the beam motor takes place automatically with that of the draw-roller motor. The d.c. supply for the draw-roller and beam motors comes from an E.C.C. mercury-arc rectifier in an enclosure immediately behind the headstock. A time-lag equipment incorporated in the d.c. system ensures a smooth start and gradual building up to the running speed.

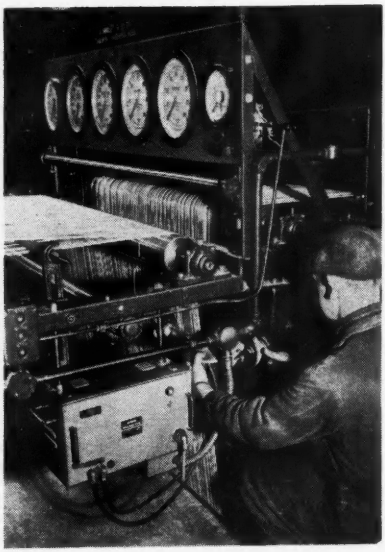
To further aid the firm building up of the beam, pressure is brought to bear on it during the winding operations by a roller

operated by hydraulic pressure provided by a small pump just behind the machine headstock. The pump is driven by a 1 h.p. 1440 r.p.m. a.c. motor from which there is a 2-to-1 ratio chain transmission to the pump shaft. The machine group can be started and stopped from any of ten push-button stations at strategic points around the plant, and when starting and stopping both the d.c. motors and the hydraulic a.c. motor operate together.

The size for the major plant is prepared

(1) A mercury-arc rectifier provides the d.c. supply for the draw-roller and beam motors; pressure is brought to bear on the beam hydraulically; pump on left. (2) Very wide thread-speed range at the beam calls for d.c. motors for the draw roller and the beam; draw-roller motor left. (3) The threads are actually submerged in the size in the modern plant. (4) From two to eight reels, according to the fineness or thickness of the cloth, are carried on the creel frame at the back. (5) Size is prepared in steam-heated kettles equipped with motor-driven stirrers. (6) The essential factors in size preparation are embraced by the scientifically designed system of "size temperature control"





Electronic measurement of moisture content supersedes the old "feel by hand" method: electrode being adjusted; valve cabinet left

in an associated equipment consisting essentially of three steam-heated vertical cylindrical kettles, each about 4ft in diameter and holding about 150 gall. During heating the solid and liquid ingredients in each kettle are continuously stirred by horizontal paddles radiating from the bottom end of a central shaft which is driven at the top by a geared motor surmounting the kettle structure. Variable speed is not called for here, but the 1·5 h.p. driving unit has very wide speed limits, the actual speed ratio being 1,450 to 30 r.p.m. Finally there is horizontal to vertical transmission, giving an actual shaft speed of only a few r.p.m.

The stirring motors are started and stopped from a central control board for the complete size-preparation installation. On this control board there are recorded for each kettle the temperatures of the size during heating, the time taken to reach the required temperature, and the maintenance of constant temperature. These essential factors are all embraced by the scientifically designed system of "size temperature control" and the required adjustments are made by a motorized valve on the steam main to each kettle, the valve being automatically controlled from the control board according to temperature pre-settings on the board.

We are indebted to Mr. J. M. Morison, managing director, John Lowson Jnr. & Co., Ltd., for permission to visit the works and to publish this and the foregoing article, and to Mr. B. M. Lowson, works manager, and members of his staff for help in obtaining the information and photographs.

Measurements Section Dinner

THERE was a larger attendance than last year's at the annual dinner of the Measurements Section of the Institution of Electrical Engineers at the Café Royal last week, which enjoyable function attracted more than 250 members and friends.

Dr. G. A. V. Sowter, chairman of the Section, welcomed the guests on whose behalf Sir Archibald Gill (president, I.E.E.) thanked the Section for its hospitality and wished it continued success. He went on to point out that measurement was more important to the electrical than to most other branches of engineering. They could not do without it; science was founded on measurement, but it needed some art too.

Sir Henry Self (deputy chairman, B.E.A.) also responded, remarking that the economist said that the installation of more plant would not enable production to catch up with the demand—but "he who laughed last laughed loudest." Last year three times as much plant had been installed as the average of the two previous years; they aimed at from four to five times as much for next year, providing outside forces did not interfere. It had also been suggested that the ripple system should be employed to control the peak demand. If that were the proper thing to do, the Measurements Section should know the answer.

Mr. F. J. Lane (Section vice-chairman) proposed the health of the chairman. He said that supplies could be given in large quantities while distribution could convey lesser amounts, but it was measurement which indicated how much was really delivered.

Dr. Sowter replied by thanking his committee and the I.E.E. staff for the work they did in and for the Section.

The Coal Position

Special Consideration for Power Stations

A REVIEW of the coal situation was made in the House of Commons on 1st February by Mr. P. Noel-Baker, Minister of Fuel and Power, in which he stressed the gravity of the situation and outlined the steps which the Government proposed to take to meet it. He also announced an increase of 4s 2d per ton in the pithead price of coal and a rise of 6s 3d per ton in the price of coke.

A statement issued by the Ministry says that there has been a large increase in the consumption of electricity in recent months and the stocks of coal at the power stations have fallen at a dangerously rapid rate. Unless this decline is checked, power stations will be forced to close down. To prevent this happening, the Government has decided to give priority to coal supplies for the power stations. The grades of coal needed for electricity are the same as those used by industry and this will mean that there will be less coal for industrial production.

The Government has consulted both sides of industry and has decided that delivery of coal to industrial firms will on average be about 85 per cent of the firms' allocations. Unless the situation gets worse, no priority will be given to particular industries at the expense of others. The divisional coal supplies officers of the Ministry will, wherever possible, continue the special assistance that is now being given to keep in operation the firms with under one week's stock. Where by reason of fuel economy a firm has been able to improve its stock position no steps will be taken to reduce deliveries because the stocks are higher than the average, provided they do not amount to more than six weeks' consumption.

Machinery will be set up under the Regional Boards for Industry to deal with arrangements between individual firms who agree to pool their coal supplies, closing certain plants so as to run other plant fully; reduction of coal supplies to firms whose production is being substantially curtailed by raw material shortage; and coal supplies to be allocated to any new firm or plant due to come into operation in the next three months.

Similar arrangements will also be applied to coke where, apart from special action to supply blast furnaces and foundries, deliveries to industry will be at 90 per cent of the stated requirements.

The Federation of British Industries has sent a circular to all its members setting out its recent activities in this connection, including its recommendations to the Government. In addition to suggesting methods of dealing with coal supplies to industry the Federation mentioned possible palliative measures.

It was found that there was at least ¼ million kW of diesel-driven auxiliary generators installed but not in regular use. Others could be added if supplies of fuel oil could be ensured and provided the B.E.A. extended the waiver on its restrictions on their use. Adjustments of tariffs would also be needed in certain cases. It was noted that the B.E.A. had since extended the relaxation of restrictions until 1956. Charges for stand-by supplies would not exceed the annual costs and charges appropriate to the capacity reserved for such connections; in addition supplies actually taken would be charged for at the normal standard tariffs.

BRISTOL TELEVISION STATION

AFTER negotiations for a site for the high-power television transmitting station to serve the British Channel area, the B.B.C. has agreed to buy land on St. Lythan's Downs, near Wenvoe, about five miles to the west of Cardiff. The station will be known as the Wenvoe television transmitting station.

The 25 acre site is 400 ft above sea-level and on it will be constructed a building for the transmitters, a sub-station and a 750ft mast similar to the one at Sutton Coldfield. The contract for the mast has been awarded to British Insulated Callender's Construction Co., Ltd., and that for the buildings to Gee, Walker & Slater, Ltd.

The vision and sound transmitters were ordered in January, 1950. The vision transmitter, which is being designed and manufactured by Electric & Musical Industries, Ltd., is to have a power of 50 kW and the sound transmitter, which Standard Telephones & Cables, Ltd., are making, will have a power of 12 kW. A novel feature of the vision transmitter is that the carrier wave will be modulated by the vision signal in a low-power stage instead of the output stage as has been customary in previous television transmitters.

It is expected that the boundary of the service area of the Wenvoe station will be roughly along a line through Barnstaple, Teignmouth, Swanage, Marlborough, Chepstow, and slightly to the north of Brecon, Carmarthen and Tenby. This area has a population of three and a half millions, and among the principal towns within it are Tenby, Carmarthen, Llanelly, Swansea, Cardiff, Bristol, Bath, Dorchester and Taunton.

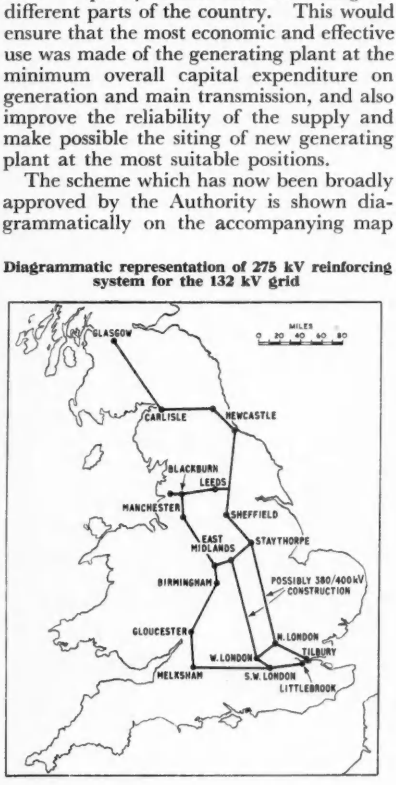
The 275 kV Grid System

Ten-Year Development Plans

THE British Electricity Authority has adopted a provisional programme to be undertaken during the next ten years for the development of the 275/300 kV reinforcement of the national grid. As was announced last year (*Electrical Review*, 3rd March, 1950), following the preliminary consideration given to this question by the Central Electricity Board, the Authority reviewed the possible future requirements and it reached the conclusion that a substantial increase was necessary in the capacity of lines interconnecting the different parts of the country. This would ensure that the most economic and effective use was made of the generating plant at the minimum overall capital expenditure on generation and main transmission, and also improve the reliability of the supply and make possible the siting of new generating plant at the most suitable positions.

The scheme which has now been broadly approved by the Authority is shown diagrammatically on the accompanying map

Diagrammatic representation of 275 kV reinforcing system for the 132 kV grid



and is expected to meet requirements up to 1960. It provides for lines running from Glasgow in the north by way of Carlisle, Newcastle and Sheffield to Staythorpe, near Newark-on-Trent, thence to the London area. From Staythorpe a line will run westward through the East Midlands and extend northwards to form a ring via Manchester, Blackburn and Leeds. From the East Midlands there will be a second main trunk line direct to the London area and a further connection southward, via Birmingham, will also link up with London via Gloucester and Melksham. There will be three main receiving centres on the north, west and south-west outskirts of London which will be interconnected and extended to form a loop round London from Tilbury on the north bank of the Thames to Littlebrook on the south bank.

As foreshadowed in the Authority's previous announcement the voltage of the new system will be 275/300 kV, but consideration is being given to designing certain sections, notably those connecting the Midlands to the London area, to be suitable for ultimate operation, if required, at 380/400 kV—the highest voltage yet proposed in any part of the world.

The work will be carried out in stages and the Authority will shortly place contracts covering those portions required to be in commission by 1955. The detailed arrangements for interconnecting the new system with the existing 132 kV grid and of coupling in a number of projected new power stations are still being worked out, but it is intended that the greater part of the new lines shall be constructed by 1955, with some sections operating at 275/300 kV.

In anticipation of the new scheme, one section of line between Staythorpe, and West Melton, near Sheffield, was put in hand some time ago and the constructional work is now in an advanced state. The first major extension to be undertaken will probably be the continuation of this circuit from Sheffield, via Newcastle and Carlisle, to Glasgow to provide reinforcements urgently required to the North East Coast.

Commerce and Industry

New Radio Industry Council

Potential Japanese Competition

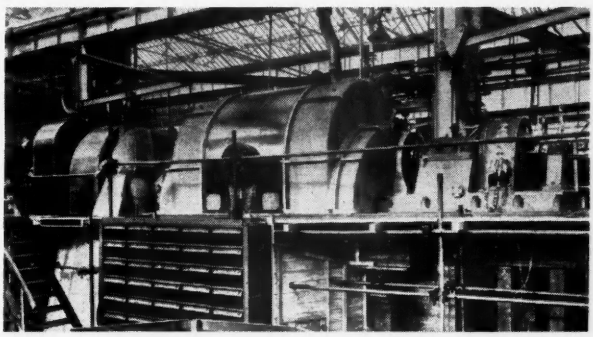
THE Radio Industry Council, reconstituted under a plan adopted by the old Council last year, held its first meeting on 25th January, when Mr. J. W. Ridgeway, O.B.E., was elected chairman and Mr. G. Darnley Smith, vice-chairman. The new Council consists of sixteen members and there is to be an Executive Committee the members of which are Messrs. P. D. Canning (Plessey), G. Darnley Smith (Bush Radio), M. M. MacQueen (G.E.C.), G. A. Marriott (G.E.C.), F. S. Mockford (Marconi's), L. H. J. Phillips (Metropolitan-Vickers), W. F. Randall (Telegraph Construction and Maintenance Co.), and J. W. Ridgeway (Edison Swan).

Festival of Britain Strike

The week's strike of about 300 electricians at the Festival of Britain site on the South Bank of the Thames, which was supported by 800 building workers there, came to an end on Saturday last. The men claimed an extra 2d an hour as "exhibition money" and agreed to return to work on the understanding that their claim was considered by the N.J.I.C. for the Electrical Contracting Industry this week.

Oilfield Equipment for Venezuela

Completed some six months ahead of schedule, a 10,000 kVA turbo-alternator ordered by Shell in 1948 from C. A. Parsons & Co., Ltd., is now on its way to Pueblo Viejo in Venezuela. The manufacturing time of fifteen months has set a new record for delivery of this type of equipment. The generator set was constructed in accordance with the British Standards for turbines and alternators and all the necessary ancillary equipment was included in the order. The plant, which cost approximately £85,000, is scheduled to be in operation by the middle of 1951 and will provide additional power for oilfields and camps along the eastern shore of Lake Maracaibo. It will be the sixth unit to be erected at Pueblo Viejo, the previous five having come from the United States—four of them in 1938 and the fifth in 1949.



10,000 kVA turbo-alternator in the works of C. A. Parsons & Co., Ltd., before despatch to Pueblo Viejo

Discussion of Piecework Ban

On Monday last representatives of the Confederation of Shipbuilding and Engineering Trade Unions met employers' representatives to discuss the ban on piecework instituted by engineering workers, mainly in the north-western area. It was agreed that the unions should recommend resumption of piecework pending negotiations. It was pointed out that piecework terms were a subject for arrangement between individual firms and their employees although differences could be referred to the district and national negotiating bodies.

Last week over a hundred members of the A.E.U. employed at Metropolitan-Vickers' Stockton-on-Tees works decided to resume piecework and overtime.

Japan as a Competitor

Since 1945 the United States has underwritten the deficit in Japan's balance of payments at a cost of $1,900 million. After next year this aid is due to cease and then, says a recently published review of commercial conditions in Japan (H.M. Stationery Office, 1s net) the country's struggle for existence can be expected to begin in earnest. Serious factors are the loss of Japan's overseas possessions, the virtual closure of the Chinese market, and the industrialization of some of her pre-war markets. Consequently United Kingdom exporters are bound to encounter strong competition (both in consumer goods and to a

growing extent in capital goods) in markets still open to Japanese trade. It is satisfactory to note, however, that the Japanese Government's expressed policy is against a renewal of the unfair selling methods practised before the war.

The booklet traces the historical pattern of the country's trade and reviews post-war conditions. Total exports (visible and invisible) are shown to have risen from $(U.S.) 271·1 million in 1948 to $580·2 million in 1949, while for the year ended June next a figure of $800 million is aimed at. Industrial production in March, 1950, stood at 84 per cent of the 1932–36 level. Besides details of the country's population (now 83 million and increasing at a rate of 1¼ million a year), topography, resources, etc., in which the high degree of hydro-electric development is mentioned, general information for business men visiting the country is included.

Ediswan Sales Conference

The 1951 sales conference of the Edison Swan Electric Co., Ltd., was held from 30th January to 1st February at the Piccadilly Hotel, London. Among those who attended were Messrs. J. W. Ridgeway (director and manager, Radio Division), J. S. A. Bunting (director and manager, Cable Division), H. Butterworth (managing director), F. E. C. Miller (director and manager, Lamp and Lighting Division), and Miss N. E. Miller (publicity manager).

Locomotives for Festival of Britain

During the Festival of Britain three British Railways locomotives, employing steam, electric and diesel-electric power respectively, are to be on exhibition at the south end of Charing Cross Railway Bridge; access to these engines will be from within the grounds of the South Bank Exhibition. The electric locomotive will be one of the 0–6–6–0 type which is being constructed for use on the Sheffield and Wath and Manchester electrification. The mechanical parts of this and similar engines are being made in the railway shops at Gorton, Manchester. The diesel-electric locomotive was erected in the British Railways works at Ashford and is now on site (the diesel engine and electrical equipment being supplied by the English Electric Co., Ltd). It is of 1,600 h.p. and is intended for use on express passenger trains.

Non-Ferrous Scrap Prices

To discourage hoarding and stabilize scrap prices so that they are in reasonable relation to the prices of virgin metal the Minister of Supply has made an Order fixing the maximum prices of non-ferrous scrap. The Non-Ferrous Metals Prices Order (S.I. 1951 No. 155) has been made after consultation with the trade, and came into operation on Saturday last.

The Order contains a list of prices and provides a formula for fixing the maximum prices of any material not included. The Minister expects in the near future to make a further Order to provide for licensing the acquisition of non-ferrous scrap and secondary metal and for the rendering of periodical stock returns. He is anxious to avoid instituting a detailed distribution scheme; the immediate return of all scrap for re-use is the best way to prevent this.

All-Electric Canteen

A temporary canteen has been erected on the new B.E.A. power station site at Chadderton for men working on the site. The equipment installed, however, will go into the permanent kitchen when this is erected. The canteen is all-electric, the equipment being supplied by James Stott & Co. (Engineers), Ltd. The boiling pans are equipped with bracket-mounted switch boxes. This is in order to prevent the overheating of the switch box and to avoid the deterioration of the wiring due to too close proximity to the pan. The switch box is sealed off so there is no chance of its being affected by moisture from the pan. Other interesting items are food steaming ovens with thermostatic control and a 2-pan fish fryer of robust

The temporary all-electric kitchen on the Chadderton power station site

onstruction. The design of the fish fryer provides for easy maintenance. A removable front panel exposes the element frame which can be pulled out in one piece. Both the terminal box and fuse box are in front and easily accessible on removing the cover panels. Fat seepage on to the elements cannot take place, owing to the all-welded pans. To complete the kitchen, there is a pastry oven, toaster and a tea making plant comprising two 20-gallon water boiling urns with suitable multipots. The canteen is designed to serve 200 meals and snacks.

Windmill generators on the roof of the Cumberland Hotel

Edmundsons' Acquisition

Edmundsons Electric Co., Ltd., has purchased the share capital of Alliance Wholesale, Ltd. Edmundsons Electric Co., of which Brig.-Gen. Wade H. Hayes is chairman, was formed shortly after the nationalization of the electricity supply industry in 1948. In that year Edmundsons purchased from the British Electricity Authority, Simpson Baker & Co., Ltd. The two wholesaling companies will continue to trade as separate entities, but in intimate association. As from 1st January last, Mr. H. J. Grant became chairman, and Mr. F. D. Pratt sole managing director, of Alliance Wholesale, Ltd. Mr. A. H. Young and Mr. J. MacNish, directors of Edmundsons Electric Co., Ltd., joined the board of Alliance Wholesale, Ltd., and Mr. A. G. Lindars and Mr. J. T. May continue as directors. Mr. I. O. Hamilton, secretary of Edmundsons, is secretary of Alliance Wholesale, Ltd. Mr. F. D. Pratt will join the boards of Edmundsons Electric Co., Ltd., and Simpson, Baker & Co., Ltd.

Modern Factory Installation

In connection with our article on the Lotus shoe factory on 26th January, Brook Motors, Ltd., inform us that they were the manufacturers of the special motors employed in the high frequency edge trimmers installed in the factory.

Windmill Generators

The restrictions on display lighting have been overcome by J. Lyons & Co., Ltd., who have installed four windmills (Lucas "Freelite") on the 120ft high rooftop of the Cumberland Hotel, Marble Arch, London, to provide an electricity supply for the windows of their Marble Arch "Corner House." The 6ft windmill blades are set on 12ft high poles and charge ordinary car batteries wired up to a special lighting circuit. Each windmill drives a 12 V generator which provides a maximum output of 20 A. Tests have shown a 25 m.p.h. wind to be sufficient to operate the generators and it was found that sufficient wind would usually be available at the top of the building.

Scottish Building Centre

Speaking at the annual meeting of the Scottish Building Centre held in Glasgow on 29th January, Col. G. Gardner-McLean (chairman) said the year 1950 had been one of increasing progress. The number of visitors during the year was 30,000, while technical inquiries dealt with totalled 16,000. Many of the professional and technical groups in the West of Scotland had continued to take full advantage of the facilities provided by the Centre, and the number of meetings and special exhibitions held in the premises had doubled.

Tinplate Workers' Scholarships

The Worshipful Company of Tinplate Workers announces that the following awards have been made by the assessors of the essays submitted by the 1950 students:—First prize: Mr. J. H. Brown (Enfield Cables, Ltd.), presented by the High Conductivity Copper Association. Second prize: Mr. P. W. West (International Combustion, Ltd.), presented by the Water Tube Boilermakers' Association. Third prize: Mr. K. E. Butterwick (Yorkshire Copper Works, Ltd.), presented by the Brass and Copper Tube Association.

Works Visit

A visit was paid recently to the works of the Alton Battery Co., Ltd., by representatives of British and Indian telephone companies. The visitors made a tour of the works and saw the various processes in the manufacture of the company's products. The party included Messrs. C. E. Hay (managing director, Auto-

matic Telephone & Electric Co., Ltd., Calcutta), G. R. Maitland (Export Department, Automatic Telephone & Electric Co., Ltd., London), R. Natarajin (managing director, Indian Telephone Industries, Ltd.), and M. A. J. Vasnaik (communications adviser to the High Commissioner for India). Mr. W. R. Montgomery, managing director of the Alton Battery Co., Ltd., accompanied the party on its tour of the works.

American Aluminium Restrictions

The United States National Production Authority has forbidden the use of aluminium for a wide range of "non-defence" products. It has also decided to reduce the use of aluminium by all manufacturers during March to 65 per cent of the average monthly use in the first six months of last year.

Packaging Exhibition

Apart from the Van Leer mobile factory referred to last week probably the greatest interest at the National Packaging Exhibition which concludes to-day at Olympia, London, centres on mechanization as a means of reducing costs, saving man-power and, by minimizing handling, securing greater hygiene. Nearly one-third of the 160 exhibitors co-operate in displaying the latest methods of filling, labelling, enclosing and bottling products of every description in packages of all shapes and sizes.

A large proportion of the equipment demonstrated is fully automatic, weighing or measuring, wrapping and labelling without attention other than seeing that supplies of materials are forthcoming. There are many electrically heated appliances for sealing purposes and also electrically-operated machines for such purposes as twist wrapping, spiral tube winding, bread slicing, pleat wrapping, Swiss roll wrapping, flat bag filling, cartoning, waxing, and automatic weighing and packing of cereals, etc.

The new three-wheel battery electric "Conveyancer" truck, model E2-20/3W, with a capacity of 2,000lb lifting to 9ft is the latest product shown by Electro-Hydraulics, Ltd., and two models from the range of vehicles displayed by I.T.D., Ltd., are the "Stacatruc" model 20EH/9, with a capacity of one ton and a lift of 9ft, and the Electricar model TLR.6 elevating platform truck, also of one-ton capacity.

Trade Announcements

Bevalite (Birmingham), Ltd., has acquired a new warehouse at 98, Gough Road, Edgbaston, Birmingham.

Mr. R. S. Hacking, formerly sales representative with Downes & Davies Ltd., Manchester and Liverpool, has now been appointed sales manager to **R. Lowther, Ltd.,** Manchester, and will be engaged mainly in organizing sales of television aerials in the Midlands and the North.

Dorman Smith Holdings, Ltd., announce that they have acquired a modern iron foundry which will be operated by their wholly owned subsidiary company, John Booth Foundries, Ltd., Preston.

Mr. A. E. Harvey, Edinburgh, has joined the staff of **L. G. Hawkins & Co., Ltd.,** to handle the company's interests in Scotland. Mr. Harvey was lately with Ekco Ensign.

Underground Lighting Equipment

Referring to the note on this subject in "Recent Introductions" (2nd February issue) the Simplex Electric Co., Ltd., points out that the fourth line from the end should read, "Alterations or extensions may be quickly effected. . . ."

Catalogues and Lists

Metropolitan - Vickers - GRS, Ltd., 132-135, Long Acre, London, W.C.2.—Technical brochure (No. 7617/2) describing the electric signalling installation on the Mile End-Stratford section of British Railways, Eastern Region.

Turnright Controls, Ltd., West Hill, Hoddesdon, Herts.—Folder on an a.c. cooker switch.

Pressed Steel Co., Ltd., Cowley, Oxford.—Illustrated brochure (No. Z.43) on refrigerating equipment for the meat trades.

Funditor, Ltd., Woodbridge House, 3, Woodbridge Street, London, E.C.1.—Folder on industrial drying and pre-heating ovens.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Revised edition of the brochure on cold pressure welding as applied to aluminium.

Imperial Chemical Industries, Ltd., Plastics Division, Black Fan Road, Welwyn Garden City, Herts.—Fully illustrated technical brochure on the "Alkathene" brand of polythene.

Major Equipment Co., Ltd., Gorst Road, London, N.W.10.—Eighteen priced and illustrated leaflets on theatre lighting equipment.

Electrical Power Engineering Co. (B'ham), Ltd., Bromford Lane, Birmingham, 8.—Priced folder on flameproof natural cooled motors, d.c. 0.25 to 25 h.p., a.c. single-phase 0.25 to 1.5 h.p. and three-phase ½ h.p. upwards.

Hackbridge & Hewittic Electric Co., Ltd., Hersham, Walton-on-Thames, Surrey.—Technical brochure (No. R227) describing "Velotrol" rectifiers for variable speed machine drives.

Chilton Electric Products, Ltd., Hungerford, Berks.—Leaflet on an earth leakage circuit breaker with thermal overload and magnetic short circuit protection, and an earth leakage trip without the two latter features.

Meteorological Instruments

Special Forms of Anemometers

SEVEN papers on electrical meteorological instruments were read in London last week at a joint meeting of the Measurements and Radio Sections of the Institution of Electrical Engineers and the Royal Meteorological Society.

The first paper, presented by Mr. G. E. W. Hartley (Meteorological Office), outlines the development of instruments for measuring and recording wind speed and direction by various electrical means. Methods of calibration and standardization are discussed in relation to the accuracy and speed of response of standard instruments and a description is given of some further models made for special investigations, or which are still in the development stage.

Wind-speed Recording

For general use in the Meteorological Office, the most suitable combination of instruments is a generator type cup anemometer with an autographic recorder comprising some form of recording voltmeter and a remote-recording wind vane connected by a self-synchronous a.c. transmission system to a recorder capable of being operated by a small torque. The cup anemometer will record the speed of the wind and the wind vane its direction.

A paper read by Mr. H. H. Rosenbrock and Mr. J. R. Tagg (both of E.R.A.) describes two recorders and an anemometer for measuring gusts, which were developed for use in a survey of the available wind power in this country. The essential feature of the recorders is that they operate unattended for one week. The first instrument is a photographic recorder which shows, at half-hourly intervals, the wind direction and the run of wind past four standard cup-contact anemometers. The second records a mark for each two miles of wind and will make up to four simultaneous records.

The anemometer for measuring gusts uses a perforated aluminium sphere as the detecting element and a mechano-electronic transducer valve to convert the mechanical response to an electrical output; it is compensated for temperature changes and the static effects of atmospheric pressure. When used with an amplifier-driven recording voltmeter, the response of the prototype instrument to an instantaneous change of wind speed from 65 to 85 m.p.h. was completed in about 0·07 sec. Modified forms of this instrument are also described which measure, respectively, the horizontal components of the wind in two directions at right angles and the vertical component.

In the third paper Mr. H. D. Hawkes and Mr. J. M. Laws (both of Elliott Bros.) outline an electrical method of resolving true wind velocity aboard ship, and a paper by Mr. J. Bell (Muirhead & Co., Ltd.) and Mr. E. M. Langham (Laurence, Scott & Electromotors, Ltd.) describes two instruments made for use in naval craft during the 1939–45 war. The first was fitted to auxiliary aircraft carriers and indicated the mean wind direction, so that the vessel might be steered correctly for the take-off and landing of aircraft. The second was fitted on larger craft for indicating, in various positions in the ship, the direction and speed of both the mean true and the mean apparent winds. The components used in both instruments are magslip transmission elements and electrical computing devices, which were originally developed for fire-control purposes.

Exploring the Upper Air

The new radar-sonde system for the measurement of upper wind and air data is dealt with in a paper by Dr. F. E. Jones, Mr. J. E. N. Hooper and Mr. N. L. Adler (all of the Telecommunications Research Establishment). In this system of meteorological sounding employing secondary-radar principles, pressure, temperature and humidity are each telemetered to an accuracy of one-thousandth part of their operating range, although the elements at present used may not be capable of measuring the meteorological parameters to this degree of accuracy. In addition, wind speed and direction are automatically measured.

In the following paper Dr. A. W. Brewer (Clarendon Laboratory, Oxford) and Mr. R. H. Dobson (Elliott Bros.) describe an automatic frost-point hygrometer for measurements in the upper air, which has passed laboratory tests and will measure any frost point from room temperature down to −80 deg C. The final paper of the symposium, presented by Messrs. A. W. Pratt, B. G. Collins, R. E. Lacey and E. W. Spink (all of the Building Research Station), deals with four electrically operated meteorological instruments used in building research.

Manchester Catering Exhibition

MANY new electrical appliances make their first appearance at the Hotel and Catering Exhibition at the City Hall, Manchester.

To assist caterers to choose their appliances and make the best use of them the North Western Electricity Board is providing a most helpful service in its combined information centre and theatre. Here, in addition to typical pieces of apparatus, can be seen photographs of actual installations, while film shows and practical talks deal with a variety of subjects affecting the caterer and hotelier.

A range of unit type cooking equipment introduced by the Arora Company includes a fish and chip fryer, and hotcupboards in various sizes, some of them combined with bains maries or toaster grillers. These units are designed to operate as separate items or to be supplied in any combination. Other Arora products shown include standard toaster grillers, warming plates, boiling plates, a doughnut cooker and a hotel fire fitted with a prepayment meter.

The new " Creda Unity " ranges, available in two sizes, are also designed for placing together in any numbers to form a continuous run. It is a simple matter to make extensions, reductions or replacements.

Examples of heavy duty electric ranges, pastry ovens and hotcupboards are among a comprehensive display by Benham & Sons, Ltd., while John Rouse (Oldham), Ltd., have a selection from their range of fish fryers, as well as potato peelers, which are also in evidence on the stands of G. Mallinson & Son, Ltd., Henry Nuttall, Rowe Bros. & Co., Ltd., and Samuel Gratrix, Ltd. An automatic multi-slice toaster is another product of the last-mentioned company. Besides hotcupboards Gardiner & Gulland, Ltd., demonstrate electrically heated food conveyors.

Among several new developments to be seen on the stand of James Stott & Co. (Engineers), Ltd., are a Continental type coffee maker (2 gall at a time) ; a 5 gall " Multipot," incorporating an automatic tap ; the fully automatic " Derby " boiler with only one control, the draw-off tap ; and hotcupboards built entirely of " Birmabright." In addition to a large number of single boilers, Jackson Boilers, Ltd., are supplying complete electrically heated still room sets for the Royal Navy.

Of special use for the small café and snack bar, the " Conacaf " apparatus comprises a twin coffee unit producing 6 pints of coffee per brew. Its makers, the Cona Coffee Machine Co., also show in operation their new " console " type " Conabar." The Kenya Coffee Co.'s two and four plate coffee brewers have been re-designed and now incorporate " Simmerstats."

A particularly comprehensive display of food preparation equipment by Crypto, Ltd., comprises mincers, mixers, slicers, fish fryers, automatic toasters, coffee mills, etc. Food preparation equipment is a speciality too of Peerless & Ericsson, Ltd., the Hobart Mfg. Co., Ltd., Swift & Swallow, Ltd., and Metcalfe Equipment, Ltd. Besides demonstrating coffee machines, Fairfax Engineering, Ltd., shows food mixers, other examples of which are to be found among the exhibits of E. J. Bowman (London), Ltd. (" Magimix "), the Churn Co., and John Mollett, Ltd. (" Ballerup "). A drink mixer accompanies food slicers and refrigerators on the Asco stand. Other refrigeration equipment is shown by Kelvinator, Ltd., and E. O. Walker & Co., Ltd.

The new Kent dishwasher (Max Arc & Electrics, Ltd.) has been designed for use where floor space is limited and it occupies only 4 sq ft. Capable of washing, sterilizing, rinsing and drying up to 2,000 pieces per hour, it is completely self-contained, incorporating a motor driven pump, reservoir tanks and immersion heaters. Three dishwashers are exhibited by Dawson Bros., Ltd. The Hoover " Glassmaster " washes 1,500 glasses per hour.

Apart from vacuum cleaners, represented by Hoover, Ltd., the British Vacuum Cleaner & Engg. Co., Ltd., and Vactric, Ltd., there is the " Electrolave " device shown by Shepherd's Aerosoles, Ltd. for cleaning carpets in situ.

Coin box room radio equipment is with a display of press button intercommunication systems, sound amplification equipment and distribution equipment manufactured by Communication Systems, Ltd. " Magneta " sound equipment, synchronous clock systems and time recorders are among the B.V.C. exhibits. Cold cathode fluorescent lighting fittings made by British Neon, Ltd., include circular models. The exhibition closes to-morrow (Saturday).

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week, the Lord President of the Council (Mr. Herbert Morrison) told Mr. P. Freeman that it was hoped that the model of the Severn Barrage Scheme would be completed in 1953 or early 1954.

Voltage and Frequency Reductions

The Minister of Fuel and Power (Mr. Philip Noel-Baker) told Mr. Steward that he was satisfied that the Electricity Boards were maintaining the declared frequency and voltage of supply so far as was possible in the present circumstances. A temporary small percentage reduction of frequency and voltage at times of peak load, when the demand exceeded the present available generating capacity, was an expedient which frequently enabled the Boards to avoid load-shedding.

Capital for Power Supplies

Capt. Duncan asked the Chancellor of the Exchequer what allocations of capital to be spent in 1951–52 for the generation and distribution of electricity had been made to the North of Scotland Hydro-Electric Board and the British Electricity Authority, respectively.

Mr. Gaitskell said he would ask the hon. member to await the publication of the Economic Survey for 1951.

Debate on Coal

During the House of Commons debate on coal supplies, Mr. Noel-Baker, the Minister of Fuel and Power, said that their greatest immediate anxiety was about stocks for the power stations. During the last eight weeks the power stations had used enormous quantities of coal. In one week the output of electricity was 23 per cent more than in the corresponding week a year ago.

Stocks had fallen and were now about a million tons short. So they gave to the power stations over-riding priority to get the coal they needed. But to keep the power stations going they had to deliver less to industry than they had originally planned. Unless there was prolonged harsh weather they hoped that this under-delivery would be roughly, varying a little with different grades, about 15 per cent. They had agreed with the suggestion of the Federation of British Industries that while the cut remained about 15 per cent, they should apply it to every section of industry.

The F.B.I. suggested that they could ease the industrial problem, ease the burden on power stations and save more coal, if they could provide oil for the stand-by generating plants which many firms possessed, and which in many cases to-day they were not using, or were not using fully.

With regard to economy measures, Mr. Noel-Baker said they had stopped shop lighting and advertisements, a saving of 50,000 tons in three months. They had asked shops, commerce and the general public to help by making every saving they could, especially in the use of electricity and gas.

Mr. Colegate asked what was being done about the sale of further electrical apparatus. Mr. Noel-Baker said that most of the Electricity Boards had stopped sales of fires completely, but private manufacturers and private shops were still selling them.

Mr. Brendan Bracken asked if it was a fact that the various Electricity Boards, and perhaps the Gas Boards, had been allowing far too generous hire-purchase terms—terms which were far more generous than anything offered by private manufacturers.

Mr. Noel-Baker said he could give a general assurance that that was not true. He would add that he believed that, with reasonable care, particularly by the general public, one million tons of coal could be saved in the next three months in shops, offices and homes in the form mainly of electricity and gas.

The Minister outlined measures to increase output, and announced that the pithead price of coal would be increased by 4s 2d a ton, and the price of coke by 6s 3d a ton.

Export of Generating Sets

Mr. Nigel Fisher asked the President of the Board of Trade, if he would ban the export of generating sets, particularly to the Union of Soviet Socialist Republics, at a time when these were needed at home to offset power cuts.

Mr. Bottomley, Secretary for Overseas Trade, replied in the negative. Exports of the smaller type of generating set which could be used in factories had not in any way interfered with the satisfaction of demand at home. They would, of course, keep the situation under review.

In replying to Sir Herbert Williams, Mr. Bottomley said that separate figures were not available of the export of electrical generators exceeding 10,000 kW, but he would circulate in the official report information received from manufacturers regarding sets produced for export in the period January to November, 1950.

This statement showed the following steam turbo alternator sets of 10,000 kW and above:—Australia (9), Canada (5), South Africa (4), India (4), Iraq (2), Abadan (Persian Gulf) (2), Southern Rhodesia (1), Mexico (1), Malaya (1), Hong Kong (1), Venezuela (1), total 31. Hydro-

electric sets of 10,000 b.h.p. and above went to the following destinations:—Portugal (4), Australia (3), India (2), Spain (1), total 10.

Exports of Telephone Equipment

Commander Noble asked the Minister of Supply what proportion of telephone equipment manufactured in this country in 1950 was exported; what countries were the principal purchasers; and what proportion it was intended to export this year.

Mr. John Freeman said that complete production figures for 1950 were not yet available, but it was estimated that exports amounted to between 55 and 60 per cent of the total. The principal purchasers were Australia, South Africa, New Zealand, India, Argentina and Canada. The proportion exported this year would depend on the success manufacturers had in obtaining orders from overseas, and on the production required for essential purposes at home, including defence.

Telephone Waiting List

Mr. Ness Edwards told Air Commodore Harvey that the waiting list for telephones numbered 540,143 on 31st December, 1950. During 1951 they expected to connect about 390,000 subscribers, including new applicants for whom local plant was available.

I.E.E. Jubilee Dinner

Birmingham Celebrations

A WARNING of the effect increased coal prices might have on electricity charges was given by Sir John Hacking (deputy chairman, B.E.A.) at the jubilee dinner of the South Midland Centre of the Institution of Electrical Engineers at the Grand Hotel, Birmingham, on 2nd February. Sir John, as vice-president of the I.E.E., was responding to the toast of "The Guests and Kindred Societies," proposed by Mr. W. H. Brent, senior vice-chairman of the South Midland Centre. He said that the electricity supply industry burned 30 million tons of coal a year. If the increase of 4s 2d was a flat rate one—and all increases since 1938 had been flat rate increases—the additional cost imposed on the industry would be between £6 million and £7 million yearly. That could not be found suddenly by increased efficiency; it could only come by additional revenue—by putting up the tariffs somehow or other.

Sir John defended the nationalized industry against its critcis. "It is very easy to achieve anything if you don't know anything about what you are trying to achieve. That is what is wrong with the critics. Sometimes one feels that one is being used as a whip to beat somebody else."

Additional generating plant had been installed in increasing amounts each year. This year it was hoped another 1,250 MW would be provided. Consumption was increasing all the time. Last year in the Midlands area industry consumed 19 per cent more than the previous year. Over the whole country the increase was about 20 per cent. Providing additional generating plant to catch up with the increasing consumption was like the greyhound chasing the hare. They were doing their best to make the greyhound go faster, but they would not mind if the hare did not go quite so fast.

The toast of "The Institution" was proposed by Mr. Oliver Lyttelton, M.P., chairman of Associated Electrical Industries, Ltd. He appealed to the men of genius in general to use some of their talent to solve the wider problems facing the world to-day. He praised the contribution the electrical industry had made and said he could see even greater accomplishments than those which had attended it during the past fifty years—the life of the South Midland Centre—but when, as a politician, he looked at the wider field, it was hard not to feel disillusioned.

Mr. D. H. Kendon, chairman of the South Midland Centre, proposed "The City of Birmingham," and in the absence of the Lord Mayor (Ald. A. Paddon Smith), who was ill, the Deputy Mayor, Ald. G. H. Humphries, responded. Replying to the toast of "The Institution," the president, Sir Archibald J. Gill, congratulated the Centre on its jubilee. Welcoming the guests and kindred societies, Mr. Brent mentioned that the chairman, Mr. Kendon, was due the next day to receive an honorary associateship from the Birmingham College of Technology.

Token Exports to France

QUOTAS for token exports have been granted by the French authorities for radio components, including valves; small electrical materials, such as switches; washing machines, and spare parts; components for domestic refrigerators; vacuum cleaners and spare parts; wireless sets; electrical household machines, other than refrigerators, washing machines and vacuum cleaners; electric cables; electric fluorescent and other lamps; and electric industrial blowers. Licences in respect of these quotas must be applied for by 31st December.

Manufacturers' Activities—VII

Transformers and Instruments

THE growing demand for large power transformers from home and overseas buyers continued last year. Among those ordered from Ferranti, Ltd., were a number of 60 MVA, 132 kV, three-phase for the B.E.A.; twenty-six 220 kV single-phase units for New Zealand; three of 20 MVA and two of 10 MVA for the Damodar Valley in India; fourteen of 11 MVA for the Johannesburg Corporation; and fourteen of 13·5 MVA at 33 kV for the Sydney County Council.

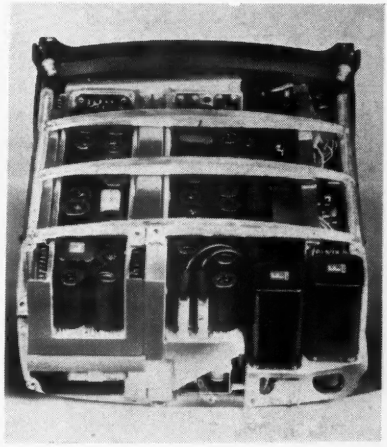
Considerable ingenuity has been required in the handling, shipping and erection of large transformers overseas; among these were two of 45 MVA, 3-phase, 150/33 kV for Portugal, while the first 3-phase, 231 kV, 64 MVA transformer to be manufactured in this country (*Electrical Review*, 22nd December, 1950), one of five ordered by the Imatra Power Co., of Finland, had to be of special construction to overcome transport difficulties.

The new transformer factory completed towards the end of 1949 is now fully occupied and in production; the lifting facilities, by crane, are capable of handling loads up to 240 tons.

The demand for distribution transformers continued at the high rate experienced in previous years, over 2,000 of this type totalling approximately half a million kVA having been ordered for delivery in all the five continents of the world, in addition to the home market.

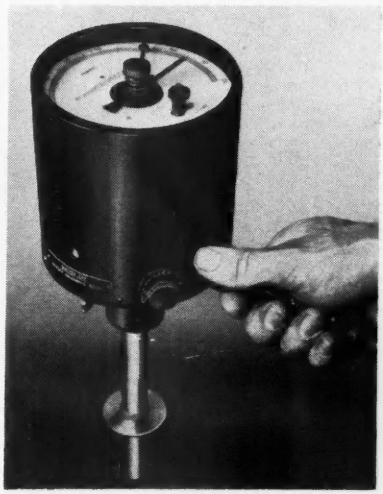
Over 330 moving coil regulators were ordered during the year, including one of 4,400 kVA, 3-phase, 6·6 kV for Australia, ten of 2,840 kVA, 3-phase, 4 kV for Brazil, a 4,550 kVA, 3-phase, 4 kV unit for Argentina and several of 11 kV 3-phase for the home market. Six 5,000 kVA, 11 kV fully automatic moving coil regulators have been delivered to the Midlands Electricity Board, two of 1,000 kVA 13·2 kV to Argentina, two of 1,500 kVA and two of 1,000 kVA 11 kV to New Zealand.

During the year a 1,400 kV impulse generator was installed at the B.E.A. research station, Leatherhead, together



Front view of mains unit (with front covers off) of aircraft distance measuring equipment

Portable industrial viscometer



with new control gear for all the testing equipment there.

Both 500 kV and 300 kV testing transformers were installed at a large switchgear manufacturer's works in this country, to be followed shortly by a second 500 kV transformer to form a 1,000 kV cascade group in conjunction with the first 500 kV unit.

In the export market 600 kV a.c. testing equipment with control gear was installed in the Oslo works of Standard Telefon og Kabelfabrik for pressure testing high voltage cables.

Several 300 kV a.c. cable testing equipments, a 1,000,000 V d.c. testing equipment and 1,500 kV and 2,100 kV impulse generators were ordered.

Turning to power factor correction capacitors, orders secured included many automatic schemes while among instruments put on the market this year a new range of dynamometer wattmeters has been developed for a.c. power measurements in single-phase and polyphase systems. A portable viscometer for the determination of the properties of oils and greases, printing inks, rubber latex, paint, cosmetics, chocolate, foodstuffs, etc., under industrial conditions, without sacrificing accuracy, is unique in that it gives immediate readings directly in c.g.s. absolute units and any change in viscosity during the test can also be observed continuously.

Type " L " 7-range clip-on ammeter has been specially designed for use on porcelain-clad fuses which, in general, are too large for the normal types of clip-on instrument.

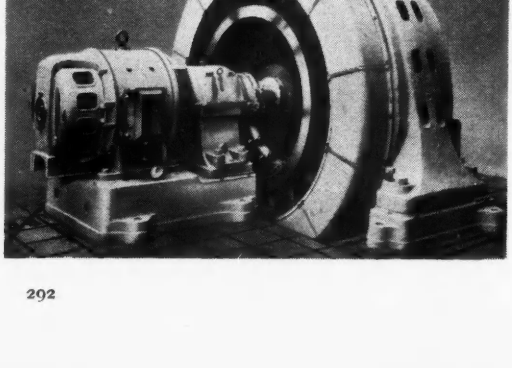
The single-phase type FM watt-hour meter in a bakelite case, having a measuring range of 100–1, is for export markets.

During the latter part of 1950 a short range radio navigational aid for aircraft, developed in the Edinburgh works, reached the prototype stage. It is an interrogator-responder system with ground equipment that is easily transportable and free of major siting problems.

Large Motors and Electronic Control

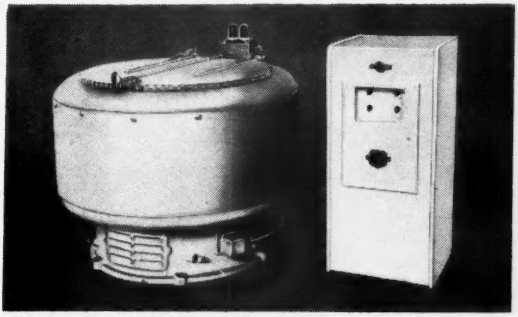
MORE of the larger sizes of machines which it manufactures were produced during 1950 than in any previous year by the Lancashire Dynamo & Crypto organization.

A typical example is an alternator (for Ruston & Hornsby, Ltd.) supplied to the Bahamas. It is one of two duplicate diesel engine driven open type alternators with a continuous rating of 1,495 kW at 400 r.p.m., 6,900 V, 60 c/s, three-phase and it is provided with a single pedestal sleeve bearing and overhung exciter armature. The machine is not provided with a separate flywheel; to secure momentum in the rotor sufficient to provide the required degree of uniformity in angular velocity, the cast steel yoke of the revolving field has been extended. For barring purposes, teeth are incorporated in this casting at the driving end. A continuous damper winding in the pole faces renders the alternator suitable for operating in parallel with six other large alternators which L.D.C. has supplied to the Bahamas on this and other contracts.



Alternator for Bahamas with extended yoke instead of flywheel for direct diesel engine drive

Self starting synchronous motors, of both salient pole and cylindrical rotor types, formed a fair proportion of the large machines produced during 1950. Many of these machines have been supplied to Australian Paper Manufacturers, Ltd.



Extractor with vertical motor of unusual proportions and electronic control panel

A typical example is one of the cylindrical rotor type used to drive a wood grinder. It is continuously rated at 2,000 b.h.p. 250 r.p.m., 3,300 V, 50 c/s. three-phase and is provided with two pedestal sleeve bearings and overhung exciter armature all mounted on a cast iron bed.

The potentialities of electronics were reflected in the increased production of "Varionic" equipment (stepless speed variation with a.c. supply by means of a grid controlled mercury arc rectifier and a d.c. machine). The group also extended its use of electronic equipment for automatic control and to this end acquired British Electronic Products (1948), Ltd., Rugeley.

An example of development in this connection is the electric drive of a new pivot extractor by Watson Laidlaw, Ltd. The electrical equipment of this 36in hydro-extractor provides a duty cycle which is initiated by the action of locking the extractor lid. Thereafter acceleration, maintaining speed and dynamic braking are controlled automatically by an electronic panel, the times being pre-set on the dials. To keep the extractor at a height convenient for the operator, the squirrel cage driving motor, which is within the skirt base, has the following unusual proportions: core length 2in and outside diameter of stator core $23\frac{3}{4}$in.

Securing Industrial Efficiency

WHAT are the reasons for the greater production efficiency in America compared with this country? Sir Claude D. Gibb (chairman, C. A. Parsons & Co., Ltd.) gave as one of the chief factors the different attitude to work when he delivered the sixth annual lecture of the Manchester Association of Engineers last Friday. He spoke of the enthusiasm in the United States which did not exist here. Only from senior management could the necessary changes be initiated.

To recreate pride in work it was first necessary that every employee should know the part he played in the ultimate product, and the part that product played in the general well-being. He must cease to feel that he was merely a cog in the machine; or if he was to remain a cog he must be convinced that he was an essential cog. Next, he must feel certain that he was getting a square deal and would continue to get it. Also, he must have conditions of employment that would assist in the restoration of his pride and stimulate his activities.

Turning to other aspects of production efficiency, Sir Claude emphasized the need for the closest link between research and design; even geographical separation, he felt, was undesirable, adding to the time-lag between research and its application. There should also be close association between design and production.

To keep costs to the minimum, the tendency of the number of non-producers in a factory to increase almost imperceptibly should be rigidly checked. Internal transport was another important item, representing anything from 5 to 55 per cent of the labour costs of an article. As an illustration, he cited a case in which the labour costs of transformer and alternator stampings were halved in a shop in which a double conveyor belt system was adopted, the top belt carrying completed workpieces and the bottom, deeply concave, one taking scrap to the store. The cost of floor space should be borne in mind. Another point was that the works engineering staff should be given opportunities of visiting the manufacturers of machinery and also of studying production methods in similar factories to their own here and abroad.

In conclusion, Sir Claude Gibb returned to his main theme that the responsibility for planning production efficiency rested on the senior management, and he expressed the belief that the finest training was basically engineering and largely in production.

Electrical Equipment Production

Summary of Census Report

A PRELIMINARY report (No. 117) of the 1948 Census of Production deals with electrical engineering (general). It covers establishments engaged wholly or mainly in the production of generating plant, transformers, dynamos, electric motors, switchgear, electrical equipment for motor vehicles, cycles and aircraft, and other electrical goods, but electric wires and cables, radio and telecommunications apparatus, batteries and accumulators, and electric lighting accessories and fittings are the subject of separate reports.

The number of establishments included in the 1948 returns is 855 against 522 in 1935. Two points to be noted are that factories employing on an average ten or fewer persons during the year are excluded and that whereas the 1948 figures relate only to the United Kingdom, earlier statistics cover also Northern Ireland.

In 1948 the gross output value was £225,629,000. This was derived by taking sales and purchases, £218,083,000, adding £9,026,000 for stocks and work in progress, and deducting £1,480,000 payment for transport by other firms. After allowing £3,921,000 paid for work given out, the net output value was £125,986,000 (It is estimated that about 99 per cent of the total net output of the establishments for 1948 is covered by the returns.) The 1935 and 1937 figures were obtained by adding work in progress directly to the value of production.

At the beginning of the Census year stocks of finished products and work in progress were valued at £51,126,000, and materials and fuel £26,549,000, while at the end of the year these items had risen to £60,152,000 and £30,470,000.

Dealing with capital expenditure in the industry, the report shows that £5,385,000 was spent on new and £586,000 on second-hand plant, machinery and vehicles acquired in 1948, equipment to the value of £288,000 being disposed of. New buildings and extensions (excluding site value) cost a further £2,065,000.

The average number of persons employed in the industry during the year (253,677) comprised 193,582 operatives and 60,030 administrative, technical and clerical staff; in addition there were 65 working proprietors and 557 outworkers. Women employees numbered 82,854. The aggregate of wages and salaries paid amounted to £77,643,000 (operatives £54,454,000), compared with £63,731,000 in 1946. In 1937 the total number of persons employed (in the United Kingdom) was 177,321, including 49,812 women, and in 1935 there were 148,957 (women 39,893).

Value of Electrical Engineering Production

	1948	1946	1937	1935
		£ (thousands)		
Value of production (gross output)	225,629	155,514	75,520	55,816
Cost of material, fuel and electricity	97,284	60,838	33,229	23,216
Amount paid for work given out	2,359	1,664	218	143
Net output	125,986	93,012	42,073	32,487
Average number of persons employed (not outworkers)	253,677	244,910	177,321	148,957
Net output per person	£497	£380	£237	£218

Batti-Wallahs' Lunch

CHILD delinquency is one of the problems which has assumed distressing proportions since the war and at last week's luncheon of the Batti-Wallahs' Society, Mr. John Watson, magistrate at the South East London Juvenile Court, gave an absorbing account of the methods adopted to deal with this important problem in which he showed that sympathetic understanding is brought to bear in the many cases which come before him, and a child who has erred (often from want of guidance or affection), is given every encouragement to become once again a useful member of society.

ELECTRICAL CONTRACTING: Organization and Routine

By H. R. TAUNTON, A.M.I.E.E.

25.—*The Politics of the Industry*

THE direction of the policy of the electrical contracting industry is largely in the hands of the E.C.A. Allied Associations, modified by their contacts with the E.T.U., on points of labour, and with the B.E.A.M.A., the E.W.F., and others, on points of material, or of general conditions. The most pressing problems confronting it to-day are the standardization of the quality of installation work and the related questions of compulsory registration and regulations.

There is no higher standard of electrical installation work than that employed by the leading British contractors working either to their own or to consultants' specifications. It is what American contractors call an "all-metal" standard, with all cables, accessories, and fittings enclosed in or mounted on a system of heavy gauge screwed conduit and iron boxes and cases, continuously bonded mechanically and electrically. It is as substantial and durable as the buildings in which it is erected; and it is proportionately expensive in its first cost. And there are other high standards developed in recent years, such as those based on aluminium or copper conduit, metal ducts, or insulated tubing, which in certain cases have their advantages. In contrast is the common system of v.i.r. wires threaded through joists and protected on walls by light gauge slip conduit: barely above the level of jerry wiring—but cheap.

Minimum Standards

The average standard throughout the country hovers between these two extremes. The question is, whether it should be made to approach more definitely one or the other; and which. One uniform standard of wiring is out of the question, if only because different types of buildings need different systems. The real point at issue, therefore, is the fixing of *minimum* standards of safe and sound installation work, systems which, while still safe and sound, shall be cheaper than what is now so accepted. In short, shall the average standard be raised or cheapened?—unfortunately it can hardly be both.

The arguments on either side are biased to some extent by self-interest. The consultants and the leading firms of contractors would have the minimum standards raised towards the level of those they specify and employ. They talk of "safety first" and would have the Wiring Rules elaborated to provide it regardless of cost, seeking the ideal of a fool-proof system. Their interest in fixed standards is mainly theoretical; for whatever may be finally adopted will certainly be lower than their own, which they will continue to use for the bulk of their work. But if something much cheaper were generally accepted it would probably reduce the demand for their armour-plated standard.

Case for Cheaper Work

The arguments on the other side for cheaper standards come naturally from the smaller contracting firms. Their strong point is that the cost of installation work to present standards is prohibitive to the small potential user of electricity, and so restricts development to narrow fields. They are all for the simplification of the rules. The small contractors' interests in this matter are the reverse of those of the larger firms. Catering already for the class which can only just afford the most economical of present standards, even with the help of assisted wiring schemes, any lowering of it would find them favourably placed to extend their activities to the large class below, which would then be able to afford it.

A just solution can only be reached by ignoring these conflicting interests and considering solely those of the community. If we do that, we are driven to a conclusion which certainly supports what used to be,

and maybe still is, the case of the supply authorities. As thus: it is not reasonable that the mass of the people should be denied a convenience and comfort so necessary to existence as electricity has now become. The high cost of installing it may prevent their having it. The cost is high because installations have to comply with certain complicated regulations framed with a single eye to safety, and none for the expense entailed in securing it.

It is not due, as some contend, to the high rate per hour which electricians command for their labour, but to the amount of labour necessarily employed under the existing code. The drastic economy necessary can only be secured by simplifying that code, at some sacrifice of the "fool-proof" ideal. If that were done, a lower minimum standard of wiring work would follow. Installation costs would be less prohibitive. The community and the supply authorities would benefit and indeed the whole of the electrical industry with the exception of consultants and the larger contracting firms; and they, as specialists, would be little, if any, the worse off.

Agreed that some simplification of the Wiring Rules is necessary if installation costs are to be reduced, not so obvious is the possibility of simplification, without too great a sacrifice of efficiency and the safety factor. The possibility exists, however; and there are certainly restrictions which could be relaxed or quite abolished. To consider them in detail would involve us in a technical discussion outside our present scope. It will suffice, as an example, to suggest one direction in which wiring costs could be reduced. The present code is much concerned with mechanical protection, as distinct from electrical insulation. But is it necessary to make such a fetish of it? Is it not, indeed, rather absurd?

Too Much Protection?

The most armour-plated of installations ends at a score of socket points with flexibles trailing across the floor to standards or radiators. They have no mechanical protection. Yet their use is not prohibited, and nobody lies awake o' nights worrying about them. Nor need they. Once in a blue moon some congenital idiot may push a pin through flex; but to try and legislate against such folly would be as sensible as taking a diving suit to the Sahara against the chance of a flood. If, then, mechanical protection is not thought necessary for flex, why is it for cables, more robust, and fixed in or on walls and ceilings, out of reach? Leave it with no other protection than its normal insulation and braiding, let all accessories connected to it be of the all-insulated type, and at a stroke you dispense with all the complications of secondary coverings and of bonding and earthing, and their cost. That alone would be a step towards a cheaper standard premised as essential to the popular development of electricity. It would be a sacrifice of some of our ideals, but not, in practice, of the needful margin of safety and efficiency. And ideals, of course, would still be approachable in the higher standards which would remain for those who could afford them.

Necessity for Compulsion

The present minimum standard of electrical wiring work cannot, however, safely be reduced unless reduction is accompanied by compulsion. Neither the public nor the contracting trade will derive any good from a simpler wiring code if it is left to the free interpretation of cheap-jacks, to be simplified still further, beyond the limit of safety, by incompetence and dishonest greed. Let us have a lower, a cheaper standard, if in no other way can we spread the use of electricity among the masses; but that standard must be an enforceable minimum. Better to have a somewhat lower standard, with nothing allowed below it, than to retain our present standards and let them be flouted as they are. To be sure we should have a lot of cheap work all over the country, but its quality would be fixed; and the average would be definitely higher.

Even the most obstinate opponent of a simpler code would accept it cheerfully if it were accompanied by the elimination of the jerry wireman, as it would be if it were made compulsory. It has been suggested that compulsory registration would have the same effect; that if no one were allowed to do wiring work who was not registered as competent to do it, the thousands who are not would be automatically put out of business. There are two flaws in the argument. It ignores the difficulty of securing compulsory registration and registration in itself is no guarantee that the registered will invariably maintain

their standards. That is the essential we are aiming at: not merely to separate the sheep, but to exterminate the goats, and to make sure that none of the survivors shall ever act as goats.

That is the real weakness of the present scheme of voluntary registration, the N.R.E.I.C.* It assumes virtue on the part of those within its fold, but it has little power to ensure it. As things are, it serves a purpose; but really its whole conception is a paradox: it exists to enforce a standard which does not exist. In short, shoddy wiring can only be stamped out by compelling all, registered or not, who undertake wiring work of any kind, to comply with minimum standards based on a universally accepted code, legally enforceable.

It follows that if it were thus made impossible for anyone to do wiring work below a given standard, there would be no need for registration at all. Those who could not do such work would cease to exist, and the others would all have the minimum status which is now the qualification for registration. The conclusion is, that not compulsory registration but compulsory regulations is the true and only solution to our problem. Let us then, concentrate on compulsory regulations, on a simplified wiring code, backed by legislation which will make non-observance of its minimum requirements a punishable offence.

What Sort of Code?

We must first, however, make up our minds what sort of a code we want, so that when the time comes we can put forward a clear-cut case. Unless contractors, and the rest of the electrical industry with them, are definite and unanimous in their proposals, these will be left to the arbitrament of lawyers and politicians, who would give us in the end nothing but the usual tangle of expensive red tape. It would be fatal, for instance—as much to electrical development as to the contracting trade—if, under pressure from powerful bodies, municipalities, and Electricity Boards, Parliament were to give them power to frame their own local standards. We must have a single code—obviously the I.E.E. Rules, or some simplification of them—uniformly applicable throughout the whole country, binding on all contractors, and to be accepted by the supply authorities.

The question next arises, how is any legal standard to be enforced? The usual answer is, by inspection. A little thought, however, will show its impracticability. Who is going to inspect? The Government? Heaven forfend that we should add another battalion to the army of "snoopers" who already dog us from the cradle to the bier! The supply authorities? That would be to allow them to pass their own work, or condemn that of contractors who might be competing with them in their areas.

Inspection Too Costly

Could the contractors, then, through their organization, inspect the work of its members? To them, apart from other objections, that of *cost* is conclusive. Inspection, to be of any use, must be almost continuous throughout the progress of a job. Consider the dozens of jobs of the thousands of contractors up and down the country, and calculate the sum of the salaries and expenses of the multitude of inspectors who would be required to certify their conformity with the code. The answer makes all talk of inspection by a contractors' organization, by an independent body such as the I.E.E., or even by the Government itself, a mere waste of breath. Inspection, however, would be unnecessary. A compulsory wiring code would be part of the law of the land, and like any other law, could be enforced by penalties for a breach of it. Make them heavy enough—even to imprisonment for manslaughter if, in a bad case, a fatality resulted from a deliberate breach—and no one would take the risk of incurring them.

With the extinction of the cheap-jack the contracting industry would be left freer to deal with competition from outside: from builders and Electricity Boards. So far as the first is concerned, competition is natural and legitimate. That of the Electricity Boards is natural enough, too—its apologists can find plenty of specious excuse for it—but it is certainly not legitimate, from a business point of view. To use public money to compete against certain contributors to it; to run

*Negotiations are proceeding for the formation of a National Inspection Council for electrical contracting work in which the B.E.A. and Electricity Boards would participate with the E.C.A. This is intended to take the place of the N.R.E.I.C.

showrooms and wiring departments without proper regard to standing charges, knowing that any losses will be met by the consumers, including the unfortunate contractors themselves: no special pleading can make of that fair trading. Its only possible defence is the plea of public policy: that electrical development is a pressing need; and that, as contractors have in the past taken no steps to meet it they cannot complain if public bodies in the interests of the community, take the matter out of their hands. And it must be admitted that in the main, the argument is fair.

The supreme advantage of the supply authorities lies in their financial resources, allowing them to develop schemes of assisted wiring impossible to the individual contractor with his limited capital and his practical need to avoid losses, to which a State-run enterprise can seemingly afford to be indifferent. The contractor, too, is handicapped by the fact that wiring, once installed, is a non-realizable asset, and the provision of credit facilities for it is therefore dependent on reliable methods of collecting, which the authorities have in a simple addition to the kWh charge through a prepayment meter.

Sale of Apparatus

The same reasoning applies to the sale of apparatus. Electricity is a public service, and it can only be extended to a large body of small consumers on easy payment terms. That extension, accompanied by a wide use of current-consuming apparatus is a prime necessity to the Electricity Boards. They cannot be expected to forgo it from any altruistic consideration for the profits of the contractors. Since they look for their profit to the sale of electricity used by the apparatus, they can afford to offer it on terms impossible to the trader. They have every facility for influencing prospective buyers. They have ready at their disposal the machinery for collecting the periodical instalments by a simple adaptation of their quarterly accounts. And, most important of all, they can enforce them, as a contractor could not, by the threat of cutting off their supply of electricity.

Generally speaking, then, assisted wiring and hire-purchase, on a popular scale, are now not a question of practical politics for the average contractor. For the one, he can only hope for what he can get by some scheme of co-operation with the Electricity Boards. For the other, his opportunities must be limited to dealings with customers of a higher grade—a higher financial standing—than those for whom the Boards cater, who yet may be glad to avail themselves of the facilities of hire-purchase as a normal alternative to cash payment. The old-fashioned prejudice against it as something not quite respectable has quite died out, and to pay out of income and enjoy use in the meantime is accepted to-day as simple common sense. There is no reason why the electrical contractor should hold himself aloof from the common trend.

Small transactions, and occasional large ones, he may be able to finance himself. If he does, he must make himself acquainted with the legal points usually governing them, to be embodied in a suitable agreement, which should have attached a complete specification of the articles to which it applies. An invoice (or statement) should never be sent with them, as it might be wrongfully used as evidence of ownership. Goods out on hire should be protected by insurance against fire and other risks. A floating policy is advisable, covering all current transactions.

Few contractors, however, can afford to tie up a lot of capital in supplying articles on hire-purchase terms; but they need not, therefore, turn away the potential customer who cannot conveniently pay cash. There are a number of companies who specialize in financing such transactions. Their security is usually the assignment of the trader's rights under the hire-purchase agreement; and they either make an advance of a proportion of the amount required under it, leaving the collection of the instalments to him, or buy, at a discount, all his interests in it, and then deal themselves with the hirer. Contractors are thus enabled, without risk or any strain on their financial organization, to sell expensive appliances at satisfactory profits to customers who, unwilling to pay cash down, would either do without them or be forced into the showrooms of the supply authorities.

Street Lighting at Stockton

THE Stockton-on-Tees Town Council has been recommended to include in its estimates £4,500 for street lighting by means of 80 W mercury vapour lamps on the Roseworth Estate.

ELECTRICITY SUPPLY

British Electricity Contracts

Tariff Revision at Douglas

DURING the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations and transmission lines amounting in the aggregate to £3,104,006. The principal contracts include :—Tilbury power station : Foundation work (Holloway Bros. (London), Ltd.) ; Brunswick Wharf station, London : Lighting and small power plug installations (London Electricity Board) ; Brimsdown " B " station : Structural steelwork (Dawnays, Ltd.) ; Bold station (near St. Helens): Main foundations and ancillary works (John Laing & Son) ; North Tees station (Middlesbrough) : Auxiliary cables and accessories (British Insulated Callender's Cables, Ltd.) ; Roosecote station (Barrow) : Auxiliary switchgear and accessories (English Electric Co., Ltd.) ; East Yelland station (near Barnstaple) : Coal handling plant (Strachan & Henshaw) ; Rye House station (Herts) : Reinforced concrete tunnel and basement for coal handling plant (Holst & Co., Ltd.) ; Meaford " B " station (near Stoke-on-Trent) : Steel frame for turbine house and boiler house buildings (Cleveland Bridge & Engineering Co., Ltd.) ; Cardiff station : Office accommodation (Wm. T. Nicholls, Ltd.) ; Portishead station (Bristol) : 132 kV, 3,500 MVA switchgear (Metropolitan-Vickers Electrical Co., Ltd.) ; Drakelow station (near Burton-on-Trent) : 132 kV, 3,500 MVA switchgear (A. Reyrolle & Co. Ltd.) ; Ocker Hill substation, Staffs : Modifications to 132 kV, 1,500 MVA switchgear (General Electric Co., Ltd.) ; St. Pancras substation : 30 MVA, 66/11 kV transformers (British Electric Transformer Co., Ltd.) ; and Bathgate and Devonside substations (S.E. Scotland) : 20 MVA, 132/11 kV and 15 MVA, 132/11 kV transformers and auxiliary transformers (Bruce Peebles & Co., Ltd.).

" Ripple " Load Control

Advocating the general use of " ripple " currents to control consumers' loads during the peak periods, the *Economist* quotes an " independent estimate " that the whole of the B.E.A.'s network could be " ripple controlled " at a cost of £2 million. The system could be applied in the cases of consumers with an annual bill of £10 or more and commercial consumers, to the number of two million. It is estimated that with two million relays and cut-outs, at £6 per installation, the total cost would be £14 million. " If each consumer were thus induced to reduce demand by one kilowatt during peak hours, two million kilowatts would be saved, and the peak load problem, with its present attendant power cuts would disappear. Generating capacity to provide that two million kW, at present prices, would cost some £120 million." It is suggested that consumers could be compensated by being charged at lower rates for supplies liable to interruption.

Concession to Yorkshire Farmers

Mr. G. B. Drayson, M.P. for Skipton, recently pointed out to Mr. Noel-Baker, Minister of Fuel and Power, that the minimum consumption charges paid by farmers were inconsistent with appeals for fuel economy, and he has received a letter from the Yorkshire Electricity Board announcing a concession to the Yorkshire farmers. The Board says that it will waive the minimum consumption guarantee, provided the agreement is extended by a period comparable with the period of suspension. In those cases where there is either a fixed charge or overall minimum payment involved in the tariff, the Board is prepared to offer the consumer the alternative flat rate tariff, but it may involve alterations to the wiring and additional metering.

Radio Power Cut Warnings

Experiments by the Yorkshire Electricity Board have been in progress for some time with a system of warning industrialists in certain districts in the Area. The proposal is to transmit short-wave signals which upon reception in works will operate warning bells or lamps. It was stated by the president of the Leeds Chamber of Commerce (Sir George Martin) that it was hoped the system would be put into operation next winter.

Harbour Light Danger

The Bridlington Harbour Commissioners are contemplating the installation of emergency equipment to maintain navigation lights and a foghorn in operation during power cuts. At the Commissioners' recent quarterly meeting it was stated that the Yorkshire Electricity Board had been approached with a view to ensuring the maintenance of electricity supply to the Harbour but the Board's reply had not been satisfactory. The matter had been reported to Trinity House.

Display Lighting Ban

The Government of Northern Ireland, following Great Britain's example, has made an

Order forbidding the use of light for display and advertisement purposes. In the Isle of Man the Lieutenant Governor has decided not to make an Order but he has appealed to shopkeepers and others concerned to refrain from display or floodlighting " so that there may be no invidious criticism of the Island in the English Press."

Algerian Hydro-Electric Scheme

In March, 1950, the Algerian Assembly voted an initial credit of 1,250 million francs for the use of the waters of Lake Chott ech Chergui for electric power and irrigation. Since that date the scheme has been the subject of controversy and the assembly has therefore instructed a commission of experts composed of hydraulic engineers from Algeria and France to report on the advisability of proceeding with the work.

Electricity Output

Electricity sent out for public supply from solid fuel fired stations for the week ended 26th January amounted to 1,185·1 million kWh, as compared with 1,223·1 million for the preceding week and 1,182·3 million kWh for the week ended 27th January, 1950. Stocks of coal at electricity undertakings at 26th January were 2,599,100 tons or 3·3 weeks' supply.

Ulster Wage Claim

Manual workers in the electricity supply industry in Northern Ireland have put in a claim for increased wages following the increase recently granted to workers in Great Britain.

Douglas Tariff Revision

As from 12th May revised tariffs are to be introduced by the Douglas (I. o. M.) Electricity Department. The lighting flat rate will range from 7¼d/kWh for the first 1,000 kWh per quarter to 3d/kWh for consumption above 5,000 kWh. The flat rate for power, cooking, heating and water heating will commence at 2¼d/kWh for the first 1,000 kWh per quarter, falling to 1½d for the next 2,000 kWh, 1d for the next 2,000 kWh and ⅞d for all consumption over 5,000 kWh. The all-in tariff (confined to private dwelling-houses) comprises a fixed quarterly charge of 3⅛ per cent of the net rateable value with a secondary charge of 1d/kWh for the first 250 kWh per quarter, ⅞d for the next 250 and ¾d for consumption over 500 kWh. A minimum annual consumption of 1,000 kWh is charged for.

When the proposals were placed before the Town Council it was stated to be impracticable to introduce an all-in tariff for boarding houses. It was also mentioned that it was intended to increase hire charges of meters, cookers, water heaters, etc., by 5 per cent.

Care of Domestic Equipment

Because of the cost of repairs in cases of improper use of electrical equipment, Doncaster Rural District Council has decided that instructions in the use of household equipment should be issued to tenants of houses belonging to the Council. A survey has been made of the cost of electrical repairs and the average cost per house per month ranges from 3s 9d in respect of temporary pre-fabs at Rossington to 9d for permanent aluminium houses at Armthorpe. The offer of the Yorkshire Electricity Board to send a demonstrator to any houses suggested by the Council has also been accepted.

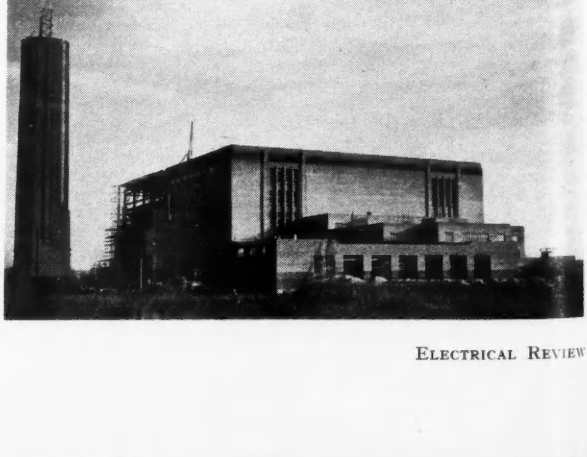
Portobello Boiler

We are informed that the capacity of the boiler installed last year in the Portobello (Midlothian) power station is 540,000 lb/hr—not 450,000 as given in the list appearing in our 26th January issue.

Street Lighting

The Boldon (Co. Durham) U.D.C. has instructed the surveyor to proceed with the provision of thirty-nine electric street lighting units on the West Boldon housing site at a cost of £1,282. The Council has decided that its street lighting programme at Boldon Colliery should include sodium lamps.

This picture shows the progress which has been made with the new Rye House (Herts) power station. Ultimately six 30 MW sets will be installed in this station; the first is now being erected



RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Indicator Lamps

NEON indicator ("Neoflec") lamps are now being made by GRAFTON, KERSTEN & Co., LTD., 77, South Audley Street, London, W.1. In these a sensitive neon bulb is protected by a translucent plastic dome (red, amber, or clear) so constructed as to allow observation of the glow from all angles. The moulded ring holding the dome is also available in various colours. Two lamps are available; type PL/225 is about 2·25in long, has a built-in resistor and can be directly connected to the mains; type PL/170 is 1·75in long and does not incorporate a resistor which can be supplied separately together with a plastic sleeve and can be fitted as required into the wiring system. A $\frac{9}{16}$in hole is all that is necessary to fit these lamps to panels.

Oil-Filled Towel Rail

The "Samtilec" portable oil-filled towel rail made by S. TIMINGS & Co., LTD., 88, Hamstead Road, Birmingham, 19, is low in price, costing only £4 12s (plus £3 8s P.T. in this country). The heavy gauge 1in diameter tube is rust-proofed and finished with two coats of cream or white stove enamel. The loading of this towel rail is only 50 W.

Variable Transformers

Simple but robustly constructed variable transformers, operating on the auto-transformer principle, are now made in ten different types varying in output from 130 VA to 2,080 VA, by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2. Those having capacities of 130 to 520 VA are housed in a "Philite" casing; heavier types of 1,040 VA or higher are cased in metal.

The bench types have a fuse in the brush lead, and are supplied with two spare fuses. Those intended for building into equipment have no fuse.

With these transformers, which are fitted with a graduated scale and a knob, a secondary voltage variable from 0 V to 20 per cent above the nominal primary voltage can be obtained. The efficiency is high, the graduated scale permits of adjustment to a fraction of a volt and owing to the low voltage loss there is constant regulation.

Automatic Greenhouse Heaters

"Humex" automatic greenhouse heaters and humidifiers are available from the ROBERTS ELECTRICAL CO., LTD., 98–100, Lavender Hill, London, S.W.1, in two models. Type "800," measuring 3ft 6in long by 1ft 4in high by 8in deep with a loading of 800 W and a water capacity of 5 gall, gives frost protection in greenhouses up to 600 cu ft; if used in very small houses (300–400 cu ft) it maintains a temperature of 60 deg F. Including a thermostat, the price is 5 gns (7s 6d extra for d.c.).

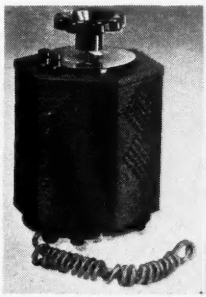
Providing frost protection in greenhouses up to 1,000 cu ft (and 60 deg F in smaller houses), model "1,250," which is 2ft 8in longer, has a loading of 1,250 W and a water capacity of 8 gall. With a thermostat the price is £8 15s (7s 6d extra for d.c.).

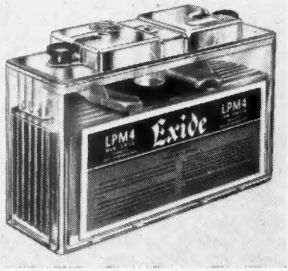
Unspillable Cell

The latest addition to the range of radio cells and small accumulators made by CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, nr. Manchester, is the "Exide" unspillable LPM4 in a moulded polystyrene container, which measures only 6$\frac{7}{8}$in wide by 2$\frac{3}{8}$in long by 4$\frac{5}{8}$in high. This cell has been designed principally for "walkie-talkie" apparatus, although it should be equally suitable for certain domestic radio receivers.

The polystyrene container offers many advantages, as it remains unaffected by wide variations in temperature, thus ensuring a long life for the cell even in tropical conditions.

Below left: Philips bench type variable transformer and, right: "Exide" LPM4 unspillable cell in a moulded polystyrene container





The separators are constructed of "Lignex," a highly absorbent wood fibre material that greatly reduces the quantity of freely mobile acid in the cell. This, combined with the specially designed lid, prevents acid spillage, even on inversion. The cells can be supplied and stored dry, thus eliminating the necessity of frequent freshening charges and the possibility of deterioration while in stock.

The capacity of these 2 V cells is 30 Ah at the 20 hr rate, the charging rate being 2 A.

Street Lantern

A lantern taking two 2ft 40 W fluorescent lamps, known as the "Two-Forty," has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for side road lighting, or for lighting narrow thoroughfares carrying main road traffic. Light control is by means of "Perspex" refractor plates cemented to the inside of the "Perspex" bowl enclosing the lamps by a method that renders the joint transparent. A feature of the lantern is the direct mounting of the lampholders on the inner surface of the bowl, thus ensuring that they are positively located in relation to the refractor plates.

G.E.C. "Two-Forty" fluorescent street lantern

The lantern body, a one-piece light alloy casting with matt aluminium finish, can be arranged for top or side entry. Quick-release toggle catches enable the bowl to be detached readily from the body when required. When the lantern is closed, a rubber gasket forms a weatherproof seal between the bowl and the body. The control gear is accommodated inside the body on a hinged tray, the underside of which serves as an over-reflector for the lamps.

Miniature Standard Cell

Standard cells have been made in this country for many years using the original H type construction where the two limbs are held apart by an arm which also serves to provide liquid connection between them. The disadvantage of this type is that it can only be used satisfactorily in one position and care must be taken in handling not to disturb the chemicals. This difficulty is overcome in the miniature cell available from the DORAN INSTRUMENT CO., LTD., Stroud, Glos, which is made in accordance with the recommendations of the National Physical Laboratory. The amount of chemicals employed remains unaltered thus ensuring a comparable life.

The two limbs of the cell are packed with mercury and mercurous sulphate in one, and cadmium amalgam in the other, a layer of cadmium sulphate crystals separating them and providing a conducting path between them. The resistance of the cell is usually about 500 Ω and the temperature coefficient about 40μV/deg C. The e.m.f. is 1·01859 V absolute and if required an N.P.L. certificate can be supplied.

Other forms of standard cell are available including the unsaturated type, which has the advantage of a low temperature coefficient, usually less than 5μV/deg C. The cell is housed in a square bakelite case with end terminals, the dimensions being 4·25in by 0·75in by 0·5in, and the weight only 2oz. A smaller unit with soldered posts can be supplied for instrument mounting.

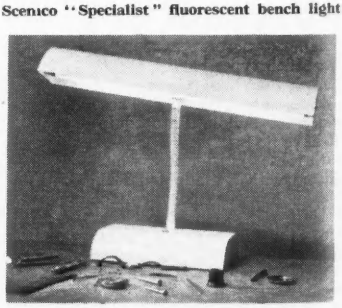
Telephone Cord Reeling Drum

Kinks and twists in telephone and other flexible cables are avoided by the use of a plastic reeling drum marketed by TELLEF (LONDON), LTD., 16, St. Albans Street, London, S.W.1, and the life of the cables is extended. The retail price of the device is 10s 3d (plus 2s 3d P.T. in this country).

Fluorescent Bench Light

A portable fluorescent bench lighting unit incorporating a 2ft 20 W tube has been introduced by SCEMCO, LTD., Soho Street, London, W.1. Known as the "Specialist," this unit will be of particular value to those employed upon detailed work such as watch repairers and instrument mechanics. The control gear is incorporated in the base, to which is attached the flexible metal arm supporting the reflector trough. The unit is finished in white stove enamel and costs £6 17s 6d complete with tube.

Scemco "Specialist" fluorescent bench light



Diesel-Electric Locomotive

Robust Construction for Industrial Service

WHEN we visited the Sheffield works of the Yorkshire Engine Co., Ltd., last week, we saw a demonstration of two 230 b.h.p. locomotives which the company has designed and built in conjunction with the British Thomson-Houston Co. Ltd., and Davey, Paxman & Co., Ltd., primarily for use in steel works, where there is a demand for a locomotive of high starting tractive effort and good low speed performance, particularly where there are severe track curvature and height restrictions.

To make them suitable for heavy industrial use, these locomotives have been increased in weight by incorporating heavy castings in the structure, and are fitted with special buffing gear to withstand end shocks.

Each locomotive is of the rigid frame type with two axles having wheels 3ft 6in in diameter on the tread, coupled together to take care of weight transfer and slip. The prime mover is a Davey, Paxman six-cylinder engine developing 230 b.h.p. at 1,250 r.p.m.; this is solidly coupled to a B.T.H. three-winding self-ventilated d.c. generator and an exciter. The power unit is mounted on a common bedplate with a Serck radiator for cooling the water and lubricating oil.

Each pair of wheels is operated by a B.T.H. reversible series-wound self-ventilated traction motor through a double reduction gear, housed in an axle-borne, oil-lubricated gear box. These motors, which are of the spring-loaded nose-suspended type, are placed longitudinally between the main frames and are hung outwards on the axles through the gear box ends.

Diesel-electric locomotive for steel works and other heavy industrial service

A single lever controls the engine speed through a mechanical linkage. The initial movement of this lever excites the generator, further movement increasing engine speed by infinite variation to maximum, after which it permits field weakening of the traction motors under relay control. There is a pneumatically operated reverser.

The engine has a maximum fuel stop and the generator characteristic is such that the engine cannot be loaded above its rated capacity. The engine is started by a C.A.V. starting motor which drives a toothed ring on the coupling; power is supplied by a 24 V battery, charged by a small generator coupled to the engine. The driver's cab has sliding doors and contains two battery boxes and the hand-brake column as well as the control desk with levers duplicated on each side. In addition to the headlights adequate lighting is provided in the cab.

The power unit compartment has louvres directing ventilating air to the generator through Vokes dry filters. There is a bulkhead at each end to isolate it from the cab and radiator compartments and a slightly positive pressure is maintained after providing for the volume consumed by the engine, to prevent the ingress of dust. Side doors provide access to the engine and other equipment.

Air Supply

A Westinghouse 25 cu ft/min compressor provides air at 105 lb/sq in for the straight air brake, through a feed valve set at 60 lb/sq in, and to an auxiliary reservoir, through a reducing valve, at 75 lb/sq in for the reverser. The pressure switch connected to the brake system prevents movement of the locomotive without sufficient brake pressure. A fuel tank of 200 gall capacity, sufficient for over 10 days' continuous service under average conditions, is situated below the power units and between the axles.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Thorn Electrical Industries, Ltd.—At an extraordinary meeting on 2nd February the shareholders approved the directors' proposal to offer 352,500 new 5s ordinary shares to existing shareholders at 15s 6d each in the proportion of one new share for each two held, and to capitalize part of the share premium account and issue it as a bonus in the form of 1,057,500 new ordinary shares on a one-for-one basis.

Pye, Ltd.—An issue is being made of 750,000 5 per cent cumulative preference £1 shares at the price of 20s 9d per share. The prospectus was advertised on Monday last and the subscription list was to open and close yesterday (Thursday).

The Superheater Co., Ltd., is to hold an extraordinary meeting on 14th March to consider a distribution of fully paid "A" 5s ordinary shares in the proportion of one for every two ordinary and/or "A" ordinary shares held. This will involve the distribution of 352,700 "A" ordinary shares.

Increases of Capital

E. N. Bray, Ltd.—Increased by £52,000, in 49,000 ordinary shares of £1 each and 6,000 7 per cent cumulative preference shares of 10s each, beyond the registered capital of £18,000. The capital has been reorganized and is now £70,000 in 20,000 7 per cent cumulative preference shares of 10s and 60,000 ordinary shares of £1 each.

Metropolitan-Vickers Electrical Co., Ltd.—Increased by £5,750,000, in £1 ordinary shares, beyond the registered capital of £250,000. This increase is for the purpose of acquiring part of the undertaking of Associated Electrical Industries, Ltd.

New Companies

Browning's Electric (Commutators), Ltd.—Registered 24th January. Capital £1,000. Electrical contractors, manufacturers of and dealers in commutators, sliprings and brush gear, dynamos, etc. Directors: W. H. Browning, Hilda M. Browning, R. W. Browning and Betty M. Browning. Regd. office: Boleyn Heath, Green Street, Upton Park, E.13.

Lumite, Ltd.—Registered in Dublin 5th January. Capital £100. Manufacturers of electric lamps, gas discharge devices, fluorescent materials, etc. Subscribers: T. Hughes and C. Coyle, 47, Dawson Street, Dublin.

Domestic Appliances (Northern), Ltd.—Registered 29th January. Capital £3,000. Manufacturers of and dealers in electric washing and drying machines, laundry equipment, etc. Directors: A. L. Hopton and Florence Kitchen. Secretary: Florence Kitchen. Regd. office: 16, King Charles Street, Leeds, 1.

D. J. Clarke (Biggleswade), Ltd.—Registered 25th January. Capital £500. Retailers, manufacturers of and dealers in electrical goods and appliances of all kinds, etc. Directors: D. J. Clarke, Ruby Clarke and V. A. Tofts. Regd. office: 4, Shortmead Street, Biggleswade, Beds.

Irish Pioneer Works, Ltd.—Registered in Dublin 6th January. Capital £50,000. Electrical and mechanical engineers, etc. Subscribers: Mary Sheehy and J. Maybury.

Companies Struck off the Register

The following companies were struck off the Register on 2nd February: M.G. Electrical Co., Ltd., Great North (Electrical Mfg.) Co., Ltd., Supra Electra Motors, Ltd., and Thames Bank Lift & Electrical Co., Ltd.

Bankruptcies

H. Sykes, electrical engineer, lately carrying on business at 3, Westfield Place, Morley, and formerly at 22, Queen Street, Morley.—First meeting to-day (9th February), at the Official Receiver's Office, 71, Manningham Lane, Bradford. Public examination 29th March at the County Court House, Dewsbury.

L. G. Sharp, 4, Summerley's Road, Princes Risborough, Bucks, electrician.—Trustee, Mr. J. H. Marshall, High Street, Princes Risborough, appointed 26th January.

Bankruptcy Petition

Reliable Radio, 244, Desborough Road, High Wycombe.—A bankruptcy petition presented by the General Electric Co., Ltd., will be heard on 23rd February at the County Court, 25, Walton Street, Aylesbury.

STOCKS and SHARES

BUSINESS in the Stock Exchange has been stimulated by the near approach of the vesting date for the companies affected by iron and steel nationalization. Holders of the present British Government and kindred stocks have been selling these in substantial amounts, and reinvesting the money in iron and steel shares and in the shares of industrial companies in other departments. This has given an impetus to buying and selling alike, and the former movement was of sufficient force to bring about a fairly general rise. In addition to this factor, prices of base metals, textiles, wool and other commodities continue strong, the effect being to cast into the background the previous apprehensions which had prevailed in regard to what the forthcoming Budget was likely to impose in the shape of fresh burdens.

Steel Bill Influences

Stocks and shares of all those companies scheduled for nationalization under the Steel Bill will be converted, on the basis of the fixed at "take-over" prices, into Government stock on 15th February. Like the railway, electricity and gas stockholders before them, the present steel company proprietors face the prospect of curtailed income and a fundamental change in the nature of their investment. To many of them, it can be assumed, the prospect is not agreeable. As mentioned above, much of the recent strength in other sections of the industrial markets is attributed to switching in advance of the take-over. It is expected that the process will continue, for some weeks ahead, to aid the demand for other industrials which might tend otherwise to contract uneasily as Budget Day approaches.

Market Notes

London Electric Wire new ordinary shares will be free of transfer stamp to the buyer until the last date for renouncing the allotment letters, the 15th of this month. Since this happens also to be the vesting day for steel shares, the point is worth noticing by holders of the latter who do not intend to await the take-over. The present price is equivalent to 47s and shows a yield of 4¼ per cent on the conspicuously conservative 10 per cent dividend paid last year: the next payment is due about the beginning of May. Lancashire Dynamo Holdings results are due at the same time. The £1 shares have lately touched a price of £5 which makes the yield 4½ per cent on the 22½ per cent payments made on the last eight successive occasions. Stockholders of Enfield Cables have until the 12th of this month to apply for the 4 per cent debentures.

Cable Dividends

Telegraph Construction are likely to be the first of the big cable manufacturers to declare a final dividend for 1950. Last time, it was reduced from 5 to 4 per cent, to conform with the increase in capital. As the interim has since been maintained at the former rate of 5 per cent, the market feels it safe to assume in any event the restoration of the total to 10 per cent. On that basis, the £1 shares at 42s 6d yield nearly 4¾ per cent. B.I.C.C. results are due in May. With the shares now at 34s 6d, the yield of less than 4 per cent, calculated on last year's 6¾ per cent distribution, seems to anticipate some relaxation of the company's dividend policy of recent years. Henley's Telegraph preliminary results appeared last year in April, while those of Siemens, Enfield and Johnson & Phillips all come out in May.

Week's Price Changes

Shares in the radio and allied market have been popular during the past few business days, and, on the week, Decca at 17s 6d are 2s 6d higher, there being smaller rises in Cossor at 11s 6d and Electric & Musical Industries, 20s 6d. Johnson & Phillips, 63s 3d, Siemens, 33s 3d, British Insulated Callender's, 34s 6d, and Associated Electrical, 86s 3d, are amongst others that have improved, while Electric Constructions, 64s 9d, are 2s 9d higher on the week and Lancashire Dynamo, 100s 9d, show a rise of 4s 6d. Telegraph Condensers put on a florin at 34s 6d, and at 6½ Tube Investments are ⅛ up. At 4s, Veritys have gained 6d: smaller advances occurred in Enfield Cables, 33s 6d, Halls Telephone Accessories 16s 6d, Radio Rentals 30s, Murphy Radio 8s 6d, Scophony 2s. Thorn Electrical are 20s, ex rights, and the new change hands on the basis of 3s 6d premium.

Pye Preference

Subscription lists were due to open and close yesterday (Thursday) for the issue by Pye, Ltd., of 750,000 5 per cent cumulative preference shares at 20s 9d. On the strength of the details given in the prospectus, and of the company's record and reputation, there are expectations (other things being equal) of a useful premium when dealings begin in a few days' time. Following this issue, and the 100 per cent share bonus distributed last month, the issued capital of the company will consist of £900,000 in preference and £432,133 in deferred stock. Prospects for the latter are held by the market to be improved by the preference issue. The 5s deferred stand now at 19s ex bonus. The financial year ends in March, the results appearing last time in July

NEXT WEEK'S EVENTS

Monday, 12th February

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Some Experience with a British A.C. Network Analyser," by G. Lyon.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "Inventor, Engineer and Manager," opened by P. P. Eckersley.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Design of Power Transformers to withstand Surges due to Lightning, with special reference to a New Type of Winding," by A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn.

NORWICH.—Royal Hotel, 7.30 p.m. I.E.E. District meeting. "A Theoretical and Experimental Study of the Series-Connected Magnetic Amplifier," by H. M. Gale and P. D. Atkinson.

Tuesday, 13th February

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "Some Aspects of Noise and Radio-Frequency Disturbance from Gas-Filled Tubes," by Prof. K. G. Emeleus.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Crystal Diodes," by R. W. Douglas and Dr. E. G. James. "Crystal Triodes," by T. R. Scott. (Joint meeting with the Cambridge University Wireless Society.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "The Inductor Compass," by A. Hine.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "The Extension of the Gas Arc Condition," by H. W. Cummings.

MANCHESTER.—Engineers' Club Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "Standardization and Simplification in the Electrical Industry," by J. T. Moore.

WIMBLEDON.—St. George's Hall, St. George's Road, 8.15 p.m. A.S.E.E. South West London Branch. "A Random Lighting Review," by E. A. Langsdon.

WORCESTER.—Recreation Club Rooms, Hylton Road, 7 p.m. E.P.E.A. Midland Technical Group. Two sound films. "Electronics" and "Electronics in Industry."

Wednesday, 14th February

BIRMINGHAM.—James Watt Memorial Institute. I.E.E. South Midland Students' Section. "Electronic Motor Control," by C. R. Bates.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "A New Theory of the Magnetic Amplifier," by A. G. Milnes.

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. District meeting. Discussion on "The Trunk Telephone System," opened by R. J. Halsey.

LONDON.—Central Hall, S.W.1, 6.30 p.m. Institution of Electrical Engineers. Faraday Lecture. "Lamps and Lighting—A Record of Industrial Research," by L. J. Davies.

I.E.E. London Students' Section, 2.30 p.m. Visit to G.P.O. Research Station, Dollis Hill, N.W.2.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 2.30 p.m. Institution of Heating and Ventilating Engineers. Annual general meeting and presidential address.

MAIDSTONE.—Royal Star Hotel, 8 p.m. A.S.E.E. Kent Branch. Film-lecture. "Seascan Radar."

NORTHAMPTON.—Northampton and District Electrical Association. 7.15 p.m. "The Use of Multi-Channel Systems, 12 Channel Carrier and Co-Axial Telephony, and Voice Frequency Telegraphy," by A. Hunt.

OXFORD.—Electricity Showrooms, S.E.B., 37, George Street, 7 p.m. I.E.E. District meeting. "Electronic Control of Resistance Welders," by B. G. Wiggins, and "Electronic Motor Control," by E. W. Forster.

Thursday, 15th February

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Fifty Years of Telecommunications in Ireland," by J. W. O'Neill.

GLOUCESTER.—Cadena Café, Eastgate Street, 6.30 p.m. I.E.S. Gloucester and Cheltenham Centre. "Sodium Lamps and their Application," by A. W. Gostt.

KETTERING.—George Hotel, 7.30 p.m. I.E.E. East Midland Centre. District meeting. "Evolution of the Lighting Art," by Dr. J. W. T. Walsh.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "The Dimming of Low-Pressure Discharge Lamps," by C. E. Williams.

NOTTINGHAM.—Gas Showrooms, Parliament Street, 5.30 p.m. I.E.S. Nottingham Centre. "Street Lighting," by W. R. Stevens.

RUGBY.—E.M.E.B. Showrooms, High Street, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Rationalized M.K.S. Units in Electrical Engineering Education," by Dr. E. Bradshaw.

Friday, 16th February

LONDON.—Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Trades Commercial Travellers' Association. Annual luncheon.

PORTHCAWL.—Seabank Hotel, 6.30 for 7 p.m. I.E.E. Western Centre and West Wales (Swansea) Sub-Centre. Dinner dance.

STOKE-ON-TRENT.—M.E.B. Showrooms, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "A Review of Research in Electricity Supply," by C. W. Marshall.

Saturday, 17th February

CARDIFF.—Royal Hotel. Association of Mining Electrical and Mechanical Engineers (South Wales Branch). Annual dinner.

LONDON.—I.E.E. London Students' Section, 10.30 a.m. Visit to Clock Tower (Big Ben), Westminster.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

30192. Mullard Radio Valve Co., Ltd., Carpenter, F. C., Lovering, P. E., Sutherland, G. L., and Moll, J. A. M. Van. —Electrophoretic coating of a top layer on to an article, more particularly on to the surface of an electric device. 11th June, 1948. (650753.)

1946

12816. Allmanna Svenska Elektriska Aktiebolaget.—Arrangement for checking the train of reply impulses in selector systems for remote control. 29th April, 1946. (650755.)

12817. Allmanna Svenska Elektriska Aktiebolaget.—Remote control systems having a reply impulse train checking the initiating impulse train. 29th April, 1946. (650756.)

27391. Allmanna Svenska Elektriska Aktiebolaget.—Remote metering and or remote regulation over a channel belonging to a remote control system. 12th September, 1946. (650760.)

28467. Sylvania Electric Products, Inc.—Electron-discharge device. 23rd September, 1946. (650935.)

33271. Standard Telephones & Cables, Ltd. Telecommunication exchange. 8th November, 1946. (650764.)

1947

161. Western Electric Co., Inc.—Lenses for radio waves. 2nd January, 1947. (650767.)

2308. Sykes, A. F.—Electrical sound recording apparatus. 6th January, 1948. (650769.)

2796. Akt.-Ges. Brown, Boveri & Cie.—Arrangements for controlling the speed of a turbo-generator for electrical networks having mainly ohmic loading. 29th January, 1947. (650770.)

3115. Scantlebury, G. S. P.—Compensating for amplitude variations of alternating voltage supplies. 30th January, 1948. (650771.)

4307. Standard Telephones & Cables, Ltd.—Telecommunication exchange. 14th February, 1947. (650875.)

11889. British Thomson-Houston Co., Ltd.—Radio detecting apparatus. 2nd May, 1947. (650937.)

12635. Western Electric Co., Inc. Line designation identifying means. 9th May, 1947. (650774.)

16144. Marconi's Wireless Telegraph Co., Ltd., and Moon, J. H.—Radio navigation aiding devices. 4th February, 1948. (650778.)

17057. De Nora, O.—Electrolytic mercury cell. 27th June, 1947. (650779.)

18523. British Thomson-Houston Co., Ltd.—Radio vision apparatus. 11th July, 1947. (650942.)

21909. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Device for producing a beam of monochromatic X-rays. 8th August, 1947. (650788.)

22103. Askania Regulator Co.—Circuits for producing and controlling pulsating unidirectional currents. 8th August, 1947. (650790.)

22348. Larsen, F. O. V.—Electrical calculating apparatus. 12th August, 1947. (650792.)

22768 9. Western Electric Co., Inc.—Piezo-electric crystal elements. 15th August, 1947. (650795/6.)

23353. Sadir-Carpentier.—Frequency band filters. 22nd August, 1947. (650799.)

23502. Newton, G. C., and Connell, W. H.—Recording of television pictures on film. 5th August, 1948. (650879.)

23722. British Thomson-Houston Co., Ltd.—Excitation system for alternating current dynamo-electric machines. 27th August, 1947. (650801.)

27572. Guyot, G. J. L., and Gillet, P.—Means for testing low frequency systems. 14th October, 1947. (650819.)

28008. British Thomson-Houston Co., Ltd.—Cyclic organoaminosilanes. 20th October, 1947. (650822.)

28475. Standard Telephones & Cables, Ltd.—Process for manufacture of artificial crystals. 24th October, 1947. (650824.)

29671. Siemens Electric Lamps & Supplies, Ltd., and Cumming, H. W. L.—Electric discharge lamps. 5th November, 1948. (650952.)

30392. General Electric Co., Ltd., and Caldwell, J. T.—Electro-medical apparatus. 2nd November, 1948. (650883.)

32469. General Electric Co., Ltd., and Levy, M. M.—Cathode-ray tube circuits. 3rd August, 1949. (650836.)

32836. Westinghouse Brake & Signal Co., Ltd.—Railway track circuits. 12th December, 1947. (650955.)

33439. Telephones Calembert & Deschamps.—Interconnection apparatus for telephone systems. 18th December, 1947. (650957.)

33618. Standard Telephones & Cables, Ltd., and Scully, C. T.—Electric pulse communication system. 17th December, 1948. (650886.)

1948

745. Philips Electrical, Ltd. (Philips Electrical Industries of Australia Pty., Ltd.).—Apparatus for the measurement of velocities. 9th January, 1948. (650965.)

1941. Electrolux, Ltd.—Cold producers for refrigerator cabinets. 22nd January, 1948. (650966.)

2004. Standard Telephones & Cables, Ltd., Reeves, A. H., and Hough, G. H.—Electric discharge tubes. 21st January, 1949. (650890.)

2657. Brush Electrical Engineering Co., Ltd., Day, C. E., and Taylor, T. C.—Torsional vibration dampers. 29th January, 1949. (650891.)

4997. Birlec, Ltd., and May, E.—Means for controlling the power factor of induction heaters and similar appliances. 19th March, 1949. (650892.)

9635. Telefonaktiebolaget, L. M. Ericsson.—Modulation devices particularly for wide frequency bands. 6th April, 1948. (651011.)

9661. Philips Electrical, Ltd.—Electric discharge tubes. 6th April, 1948. (651012.)

9850. Llewelyn, A. I.—Electric control circuits. 31st March, 1949. (650894.)

10580. Daphne Investment Trust.—Electro-magnetic recording on, and reproducing sound from, disc-shaped sound carriers. 16th April, 1948. (651016.)

13229. Ekco-Ensign Electric, Ltd., and Stickley, W. A. —Circuit arrangements for electric discharge lamps. 11th May, 1949. (650992.)

14042. Hume, W. E.—Cable holder for electrical apparatus. 9th June, 1948. (650994.)

14394. Revo Electric Co., Ltd., Felton, A. E., and Hartill, P.—Directional refractors for street lighting. 28th May, 1949. (650995.)

15119. Western Electric Co., Inc.—Magnetic recorders. 4th June, 1948. (650997.)

16512. Radio Corporation of America.—Telegraphones and paper tape records therefor. 18th June, 1948. (650899.)

17207. Maschinenfabrik Oerlikon.—Electric power transmission system especially for vehicles. 25th June, 1948. (651029.)

18420. Soc. Electro-Mécanique de l'Aveyron.—Electric brakes. 8th July, 1948. (651033.)

20073. K.L.B. Electric, Ltd. (trading as Standard Electrical Engineering Co.), and Snell, A. C.—Loudspeakers. 29th August, 1949. (650907.)

20330. Lucas, J., Ltd., and Whitehouse, H. E.—Alternating electric current generators. 11th July, 1949. (650908.)

20779. Babcock & Wilcox, Ltd.—Steam generators. 6th August, 1948. (651043.)

21095. M-O Valve Co., Ltd., and Staerck, T. H.—Grid electrodes for electric discharge devices. 7th July, 1949. (651045.)

21134. Philips Electrical, Ltd.—Circuit arrangements for generating alternating voltages from direct voltage source. 11th August, 1948. (651046.)

21366. Babcock & Wilcox, Ltd., and Evans, R. H. Vapour generating and superheating units. 12th August, 1949. (651048.)

21894. Barnes, H. E., and Pearce, A. V. M.—Electrical units for radio receivers and the like. 17th August, 1949. (650912.)

22220. Thermega, Ltd., Swindells, V. E., and Blackburn, J. E.—Thermostatic electric switches for energy input regulators. 26th July, 1949. (651051.)

22320. Bendix Aviation Corporation.—Telemetering with phase modulation. 24th August, 1948. (650855.)

23153. Mullard Radio Valve Co., Ltd., and Overton, B. R.—Television time base circuits. 2nd September, 1948. (650856.)

23173. Metropolitan-Vickers Electrical Co., Ltd., and Scoles, G. J.—Filter circuits. 12th May, 1949. (650857.)

23612. Babcock & Wilcox, Ltd., and Evans, R. H.—Furnace chambers. 1st September, 1949. (651055.)

23884. Sangamo Weston, Ltd.—Synchronous electric motors. 10th September, 1948. (650915.)

24260. Metropolitan-Vickers Electrical Co., Ltd. (General Electric Co.).—Field coils for salient pole dynamo-electric machines. 15th September, 1948. (651060.)

24365. Metropolitan-Vickers Electrical Co., Ltd.—Electron-discharge devices. 16th September, 1948. (651061.)

25435. Watt Gluhlampen-und Elektrizitäts-Akt.-Ges.—Method for producing a glass envelope for enclosing the electrode system of an incandescent lamp, electronic tube or the like. 29th September, 1948. (651066.)

25643. Metropolitan-Vickers Electrical Co., Ltd., and Blears, J.—Magnet systems for mass spectrometers. 13th September, 1949. (650861.)

26288. Standard Telephones & Cables, Ltd., Gould, W. F., Branch, M. C., Brooks, L. J., and King, P. M.—Telegraph receivers. 7th October, 1949. (650917.)

28035. British Thomson-Houston Co., Ltd.—Thermal responsive electric switches. 28th October, 1948. (650865.)

28036. British Thomson-Houston Co., Ltd.—Thermostatic selective heating, cooling and circulating interlocking control systems. 28th October, 1948. (650866.)

28564. Beltone Hearing Aid Co.—Electron-tube amplifier chassis. 3rd November, 1948. (650867.)

28674. Standard Telephones & Cables, Ltd., and Towner, S. H.—Electro-magnetic relays. 4th November, 1948. (650919.)

31929. Bradfield, G.—Mountings for piezo-electric magneto-strictive or like devices. 23rd December, 1949. (650926.)

1949

30815. Sykes, A. F.—Electrical sound reproducing apparatus. 6th January, 1948. (650808.)

1950

5951. Sykes, A. F.—Electrical sound recording and reproducing apparatus. 6th January, 1948. (650809.)

Amended Specifications Published

536454. Standard Telephones & Cables, Ltd., & ors.—Arrangements for changing over to spare amplifiers or oscillators.

636629. Sangamo Weston, Ltd.—Electrical measuring instruments.

South African News

From Our Cape Town Correspondent

THE Electricity Supply Commission expects to spend about £8,000,000 on the new Umgeni power station in the New Germany district of Natal. So far only the preliminary work has been done on the 30 acre site. The station is scheduled to go into operation in 1953, and the first stage will consist of one cooling tower, four boilers and two 30 MW turbo-generators. There will ultimately be a total capacity of 240 MW.

The Electricity Supply Commission's long-range plans envisage a new power station at East London with an initial capacity of 30 MW and an ultimate capacity of 90 MW. There will also be an additional power station in the Southern Transvaal area with an ultimate capacity of 200 MW. At Port Elizabeth it is planned to have a base-load station with a preliminary installed capacity of 40 MW and an ultimate capacity of 120 MW.

The Kimberley station of the De Beers Consolidated Mines is to be taken over and the present 20 MW capacity increased to 32 MW.

In the year ended 31st July, 1950, the Durban electricity department sold 429·6 million kWh, about 10 per cent more than in 1948–49. There was a large deficit which will be met from the reserve fund. It has been possible to reduce capital charges and working expenses per kWh, but on the other hand there has been a 20 per cent increase in the cost of energy purchased from the Electricity Supply Commission. During the year the number of new domestic appliances connected was 2,074, which was 1,748 items fewer than in the previous twelve months. This is believed to be due to the influence of import control and to the fact that the Council suspended its assisted purchase plan in September, 1949.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Atherstone.—26th February. R.D.C. Street lighting equipment. (See this issue.)

Australia.—MELBOURNE.—27th February. Department of Civil Aviation. Supply of 264,000 yd of underground cable. (C.R.E. (I.B.) 52052/51. Ten/2083.)* 3rd April. Insulated copper winding, resistance and fuse wires. (C.R.E. (I.B.) 52052/51. Ten/2084.)*

6th March. Department of Civil Aviation. Constant current regulators. (C.R.E. (I.B.) 52051/51. Ten/2108.)*

BRISBANE.—20th April. City Council. 7,500 kVA transformers. (C.R.E. (I.B.) 52351/51. Ten/2115.)*

7th March. State Electricity Commission. Switchboard panels. (C.R.E (I.B.) 51683/51. Ten/2103.)*

5th April. City Electric Light Co., Brisbane. Supply, delivery and maintenance of one 7,000 kVA, 3-phase, 33/5.2 kV indoor type transformer. (C.R.E. (I.B.) 51608/51. Ten/2101.)*

Blackpool.—14th February. Town Council. Electrical installation, Arnold High School for Girls. Borough surveyor.

Bournemouth.—9th March. Corporation. Dismantling and removal of existing lifts and supply and installation of electric passenger lifts at the Town Hall. (See this issue.)

Dagenham.—24th February. Town Council. Street lighting conversion. (See this issue.)

Derbyshire.—20th February. County Architect's Department. Cables, conduit, lamps and electrical accessories for the year ending 31st March, 1952. (See 2nd February issue.)

Hertfordshire.—21st February. County Council. Lamps. Central purchasing officer, The Old Rectory, Hatfield.

High Wycombe.—21st February. Town Council. Concrete lighting columns, with lanterns, chokes, wiring, etc., for Hughendon Road. (See 26th January issue.)

Keighley.—10th March. Corporation. Fluorescent lighting at public abattoir. (See this issue.)

Lincoln.—16th March. County Council. Electrical work at new secondary school, North Hykeham. (See this issue.)

Manchester.—26th February. Education Committee. Electrical installation, Charlestown Infants' School, Pilkington Road. City architect.

New Zealand.—WELLINGTON.—19th February. Post and Telegraph Department. Electrolytic condensers. (C.R.E. (I.B.) 52372/51. Ten/2111.)* 20th February. Milliameters. (C.R.E. (I.B.) 52374/51. Ten/2110.)* 26th February. Capacitors. (C.R.E. (I.B.) 52371/51. Ten/2112.)*

AUCKLAND.—2nd April. Auckland Electric Power Board. Fifty-five 300 kVA, and eight 450 kVA transformers. (C.R.E. (I.B.) 51965/51. Ten/2087.)* 16th April. Cable. (C.R.E. (I.B.) 51966/51. Ten/2086.)*

North of Scotland.—19th March. Hydro-Electric Board. 132 kV steel tower transmission line between Beauly and Shin. (See 26th January issue.)

Poole.—20th February. Town Council. Lamps, cables, fittings, water heaters, conduit, wiring accessories, etc. Borough surveyor.

Salford.—26th February. City Council. Electrical installation at proposed Summerville Road Primary School. (See 2nd February issue.)

Solihull.—17th February. U.D.C. Electrical fittings and lamps. Surveyor, 90, Station Road, Solihull, near Birmingham.

Tangier.—22nd March. Tangier Zone Water and Electricity Services Administration. Water-cooling plant for Mogoga power station. (C.R.E. (I.B.) 52171/51. Ten/2095.)*

Thailand.—BANGKOK.—15th March. Stores Division, Railways Department. Underground cables for railway signalling. (C.R.E. (I.B.) 52557/51. Ten/2116.)*

Thurrock.—27th February. U.D.C. Refrigerators for council houses. (See this issue.)

Uruguay.—MONTEVIDEO.—Usinas Electricas y Telefonos del Estado. Closing date for tenders for equipment for the "Jose Batlle y Ordonez" thermal power station extension postponed until 3rd May and amendments made to the specification. (C.R.E. (I.B.) 60735/50. Ten/1625C.)*

ORDERS PLACED

Exmouth.—Roads and Works Committee. Lighting fittings at Pavilion (£497).—Clark & Fenn, Ltd.

Kidderminster.—Corporation. Electrical installations in 332 Council houses (£5,445).—Wilcox Bros.

Newcastle-on-Tyne.—City Council. Rewiring of forty-one houses in Tynevale Terrace, Walker (£390).—Tomkins and Stubbs.

Plymouth.—City Council. Illumination of the Hoe, etc., for the Festival of Britain (£5,627).—Madge & Son.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—"Gregory" flats (54) at Maes-y-Bwlch, and Plasheley for T.C.; Gee, Walker & Slater, Ltd., London.

Alnwick.—Houses (200) to be erected this year and 1952 for the R.D.C.; Reavell and Cahill, architects, Lloyds Bank Chambers.

Barrow - in - Furness.—R.C. voluntary secondary school, Rating Lane (£170,000), by direct labour; J. N. Flitcroft, borough surveyor.

Baschurch.—Dairy block at Farm Institute; A. G. Chant, architect, Column House, London Road, Shrewsbury.

Billingham-on-Tees.—Houses (160) in Rosebery Road for the U.D.C.; J. H. Hill, surveyor.

Birkenhead.—Nurses' preliminary school, for Liverpool Regional Hospital Board; regional architect, Alder Hey Hospital, West Derby, Liverpool, 12.

Blackburn.—Houses (1,000) in new neighbourhood unit at Knuzden Brook for T.C.; W. Pickstone, borough engineer.

Blaydon-on-Tyne.—Houses on 100 acre site at Stella; U.D.C. surveyor, Council Offices.

Bradford.—Omnibus garage, Hammerton Street (£20,000); W. H. Leathem, town clerk, Town Hall.

Police traffic divisional headquarters at Bolling Road, Caledonia Street (£199,000); J. T. Castle, city architect.

Carlisle.—Alterations and additions to Carlisle General Hospital for the Hospital Board (£20,000); John Laing & Sons, builders, Dalston Road.

Chesterfield.—New estate at Chatsworth, with provision for 500 houses, shops, hostel, etc., for Housing Committee; R. Clegg, town clerk.

Dagenham.—Bakery, Hainault Industrial Estate; London Co-operative Society, Ltd., 54, Maryland Street, E.15.

Darlington.—Primary school, Salters Lane for the E.C.; borough architect.

Gosforth.—Houses at Regent Farm (69 acres) for the U.D.C.; C. Wyld, surveyor.

Harlow New Town.—Factory; Revertex, Ltd., King William Street House, Arthur Street, London, E.C.4.

Hull.—Chemistry building at University College; W. A. Forsyth and Partners, architects, 47, Nottingham Place, London, W.1.

Ilkley.—Infants' school, for County E.C.; county architect, Bishopgarth, Westfield Road, Wakefield.

Keighley.—Erection of junior school at Bracken Bank estate for E.C.; J. Wharton, Ingrow Bridge.

Liverpool.—Hostel for aged persons, Aigburth (£45,000); city engineer, Dale Street.

Penge.—Junior school, for Kent E.C.; Geo. Fairweather, architect, 28, Wigmore Street, W.1.

Plymouth.—Primary school, Johnstone Terrace, for E.C.; Louis de Soissons and Partners, architects, 5, Portland Square.

Rochdale.—Conversion of Holland Street Mill into technical school (£40,000); S. H. Morgan, surveyor.

Rugby.—Houses (31) at Wolston for R.D.C.; G. W. Deeley, 27, Avon Street, Coventry.

St. Albans.—R.C. Secondary School, Main Road; Archard, Worrow and Hardy, architects, 20, Lowndes Street, S.W.1.

Seaham.—Houses (80) for the U.D.C.; A. M. Smith, surveyor, Tempest Place.

Sedgley.—Houses for U.D.C. 30 at Boundary Hill and Ellowes Road; Tomlinson Bros., Wolverhampton Road. 16 at Hickmerlands Lane; W. Whittingham, Ltd., Powlett Street, Wolverhampton.

Somerset.—Schools at Backwell, Wivelscombe, West Monkton, Wells, Wellington and Keynsham, for E.C.; R. O. Harris, county architect, Park Street, Taunton.

Southend-on-Sea.—Boys' high school (£204,499); F. W. Smith, architect, 30, Alexandra Street.

Sunderland.—Primary and infants' schools on the Thorney Close estate for the E.C.; borough architect, Grange House, Stockton Road.

Tamworth.—College of further education (£85,600), for County E.C.; County Education Offices, Green Hall, Lichfield Road, Stafford.

Wallasey.—R.C. secondary school, Ormonde Street; F. X. Velarde, architect, 3, Abercromby Square, Liverpool.

Whitehaven.—"Easiform" (82) and 38 traditional houses for T.C.; John Laing & Son, Ltd., Carlisle.

Wigan.—Church of St. Annes; Quiggin and Gee, architects, Harley Buildings, 11, Old Hall Street, Liverpool.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Bulldog" cable grips.

"Parrish" switches.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.